

CORPS SUPPORT COMMAND PLANNER VERSION .01B

A thesis presented to the Faculty of the U.S. Army  
Command and General Staff College in partial  
fulfillment of the requirements for the  
degree

MASTER OF MILITARY ART AND SCIENCE  
General Studies

by

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MHA, Baylor University, Waco, Texas, 1998  
MS, Troy State University, Troy, Alabama, 1992

Fort Leavenworth, Kansas  
2000

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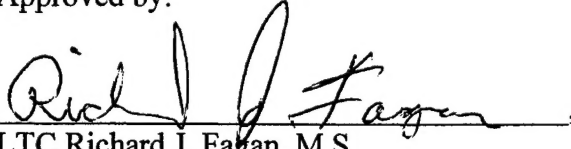
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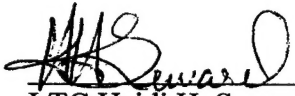
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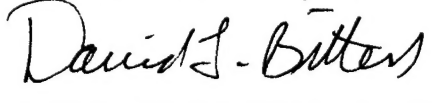
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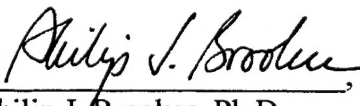
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## ABSTRACT

CORPS SUPPORT COMMAND PLANNER VERSION .01B by Major Lawrence V. Fulton, USA, 64 pages.

The purpose of this research was to determine whether it was feasible to design software that compares logistics requirements to unit capabilities, recommends task organizations for logistical support, evaluates both the operational and tactical logistics functions, and produces both the personnel and logistics estimate. The end state for this research was Corps Support Command (COSCOM) Planner Version .01B.

By incorporating existing logistical software into a Visual Basic for Applications Excel derivative, COSCOM Planner Version .01B answered the research question, is it possible? with a definitive "yes."

Decision matrix results indicated that COSCOM Planner Version .01B will be a useful tool for logisticians. Further usability testing and algorithm improvement is required to ensure its survivability over the next several years.

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## LIST OF ABBREVIATIONS

CDE	Chemical Defense Equipment
CHS	Combat Health Support
COSCOM	Corps Support Command
DODIC	Department of Defense Identification Code
FM	Field Manual
FSS	Field Service Support
GSS	General Supply Support
LEW	Logistics Estimates Worksheets
LIN	Line Item Number
MA	Mortuary Affairs
MTOE	Modified Table of Organization and Equipment
OPLOG	Operational Logistics
PSS	Personnel Service Support
SB	Supply Bulletin
ST	Student Text
STON	Short Ton
TACLOG	Tactical Logistics

## CHAPTER 1

### INTRODUCTION

#### The Research Question

The purpose of this research is to determine whether it is feasible to design logistics software that:

1. Compares logistical requirements to unit capabilities,
2. Recommends task organizations for logistical support,
3. Evaluates the operational and tactical logistics functions, and
4. Produces both the personnel and logistics estimate.

The end state of this research is Corps Support Command (COSCOM) Planner Version .01B, a computer program which addresses all issues of the research question.

The intent of this research and COSCOM Planner Version .01B is not to replace the mission analysis of the logistician, but to assist in this time consuming process. By evaluating the capabilities of units versus logistical requirements of the mission and by recommending unit selection based upon need, the program provides a quick evaluation that is especially useful in time-constrained analysis of theater, corps, division, and task force missions. The program will serve as a decision support tool for logistical planners, particularly those at the corps and division levels.

#### The Context

The number of logistics tools available to planners is ubiquitous; however, no logistics tool to date provides planners with suggested unit recommendations based upon the capabilities specified in the modified tables of organization and equipment (MTOE). In fact, few tools to date have attempted to tackle the problem of the inherent capability

associated with units to provide their own support. Instead, it is left to logistics planners to sort through what is needed and what is not, sometimes very painfully. In addition, very little software has attempted to address the issues of reception, staging, onward movement, and integration (RSOI). Software that could accomplish these tasks would be useful for both the operational and tactical logistics planners.

### Assumptions

This research relies almost exclusively on secondary data from logistics planning sources. This reliance requires one major assumption. The assumption is that the underlying secondary data sets provide accurate planning numbers. Since these data sets stem from official Department of the Army Field Manuals (FMs) and other publications and resources, the assumption will be considered as a fact for purposes of programming; however, the literature review will reveal some significant errors in some resources. All computer models are wrong, but some are very useful. With that truth in mind, the research can continue.

### Definitions

To objectively compare existing logistics software with COSCOM Planner Version .01B (which will be part of the research design as specified in chapter 3), a few operational definitions of appropriate evaluation criteria are required. Table 1 provides these definitions.

Table 1. The operational definitions for evaluation criteria

Criterion	Definition	Advantage
Speed	Loading speed of program	Lower is better
Size	Size in megabytes of program files	Smaller is better
Unit capabilities	Ability of program to determine unit logistic capabilities	"Yes" is better
Shortfalls	Ability of program to determine logistics shortfalls	"Yes" is better
Stockage	Ability of program to determine days to achieve stockage objective	"Yes" is better
Personnel Estimate	Ability of program to provide a personnel estimate	"Yes" is better
Terminal throughput	Ability of program to evaluate terminal throughput (port and airfield)	"Yes" is better
User friendliness	Five-point Likert scale assessment	Higher is better

### Limitations

Because of the limitations of the application platform (Microsoft Excel), only 65,536 database entries are available per individual Excel sheet. This limitation became a conquerable challenge, albeit time-consuming. Nevertheless, future add-ons must consider this limitation.

### Delimitations

Due primarily to time constraints, the researcher will produce only a beta model available for future modification and testing. The model will be fully functional but will require the further testing and modification to reach distribution quality. The end state

for COSCOM Planner Version .01B, then, is the development of a launching platform for further expansion.

### Significance

The primary value of this thesis is that it seeks to provide logisticians with new capabilities for analysis of tactical and operational problems by addressing areas that other software has not addressed. With the exception of JFAST (a joint strategic deployment model), LPXMED (a joint medical planning model) and an interesting attempt to capture fuel data by the logistics estimate worksheet (LEW), almost no other logistics software has attempted to realistically evaluate unit capabilities and limitations and compare them with requirements. In addition, only JFAST attempts to capture any of the operational logistics functions of reception, staging, onward movement, and integration (RSOI), with a clear bend towards sea and air port reception. Other capabilities and limitations are discussed in further chapters; however, COSCOM Planner Version .01B bridges the gap between JFAST and OPLOG Planner, and adds capabilities to both.

### Summary

In summary, this research focuses on providing logistics software that fills the gap between the operational and tactical levels of logistics. With this goal in mind, a review of the appropriate literature and studies is necessary in order to establish basis for this research. Chapter 2 establishes the research foundation for generating the software.

## CHAPTER 2

### LITERATURE REVIEW

#### The Framework

Designing software for logistical planning requires that the programmer be intimately familiar with existing software and appropriate literature. This familiarization should allow the researcher to incorporate the best aspects of all resources into a completed software package. The following sections discuss the data included in COSCOM Planner Version .01B by Operational Logistics (OPLOG) or Tactical Logistics (TACLOG) functions after reviewing available software.

#### Available Software

A few existing software programs provided the basis for COSCOM Planner Version .01B. The first program, OPLOG Planner, provided extensive unit databases in DBASE, which, once converted to Microsoft Access and queried appropriately, provided tables for calculation of fuel, ammunition, and other supply requirements for COSCOM Planner Version .01B. Figure 1, a screen snapshot of OPLOG Planner illustrates that the program is slightly antiquated as it has no Graphical User Interface (GUI). The numbers behind the program, however, are more than impressive.



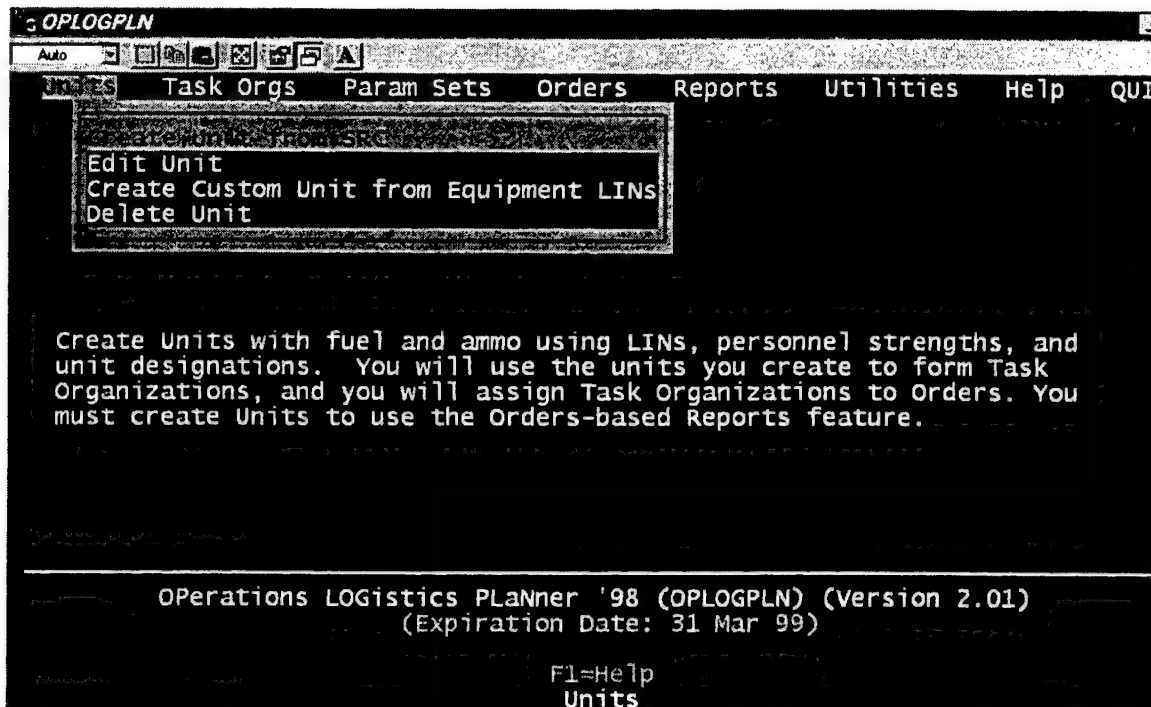


Figure 1. Screen snapshot of OPLOG Planner.

Another program, the logistics estimate worksheet (LEW) provided a simplistic look at some planning algorithms. Although useful, the LEW did not serve to provide any additional input into COSCOM Planner Version .01B. In fact, the LEW unfortunately provides no method for calculating ammunition consumption. Figure 2, a screen snapshot of the LEW reveals that the spreadsheet is under-developed but useful. Note the multiple tabs for viewing different logistics information.

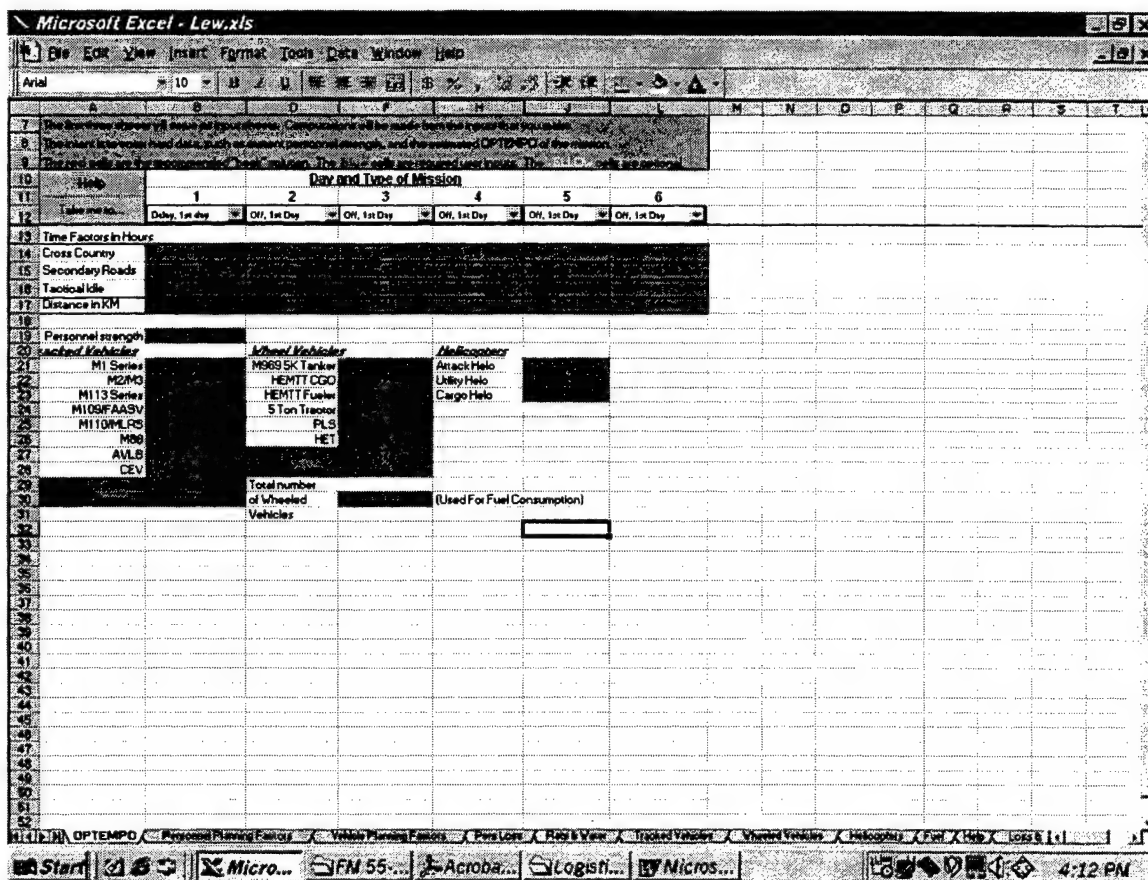


Figure 2. Logistics Estimate Worksheet.

LPXMED is another useful logistics program that actually does compare requirements to capabilities; however, it applies only to medical facilities. Nevertheless, the value of LPXMED for medical planners is significant, especially since it operates in either a deterministic or stochastic mode (allowing planners to see the effects of distributions on multiple iterations of a scenario). Figure 3 a screen snapshot of LPXMED reveals that it has a GUI interface and that it is a flow simulation model. LPXMED is an excellent simulation, which works either deterministically or stochastically; however it is specifically geared to the medical community.

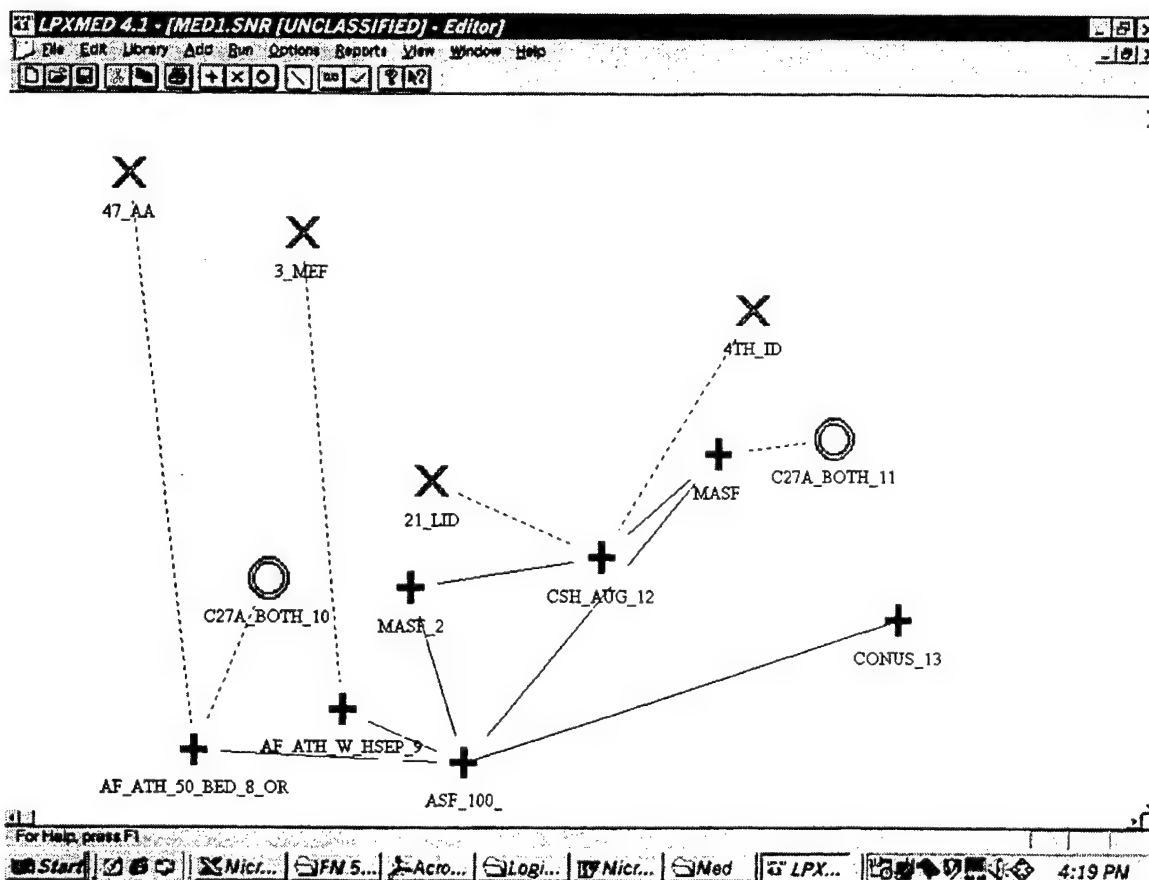


Figure 3. A snapshot of LPXMED.

Another useful software tool, which partially addresses both strategic and operational concerns for logisticians, is JFAST. JFAST is a software front end for a FOXPRO database, which contains information about ports, airfields, etc. and uses a simple algorithm for determining sustaining requirements of deploying forces. Unfortunately, JFAST focuses only on port to port movement and not the full range of Reception, Staging, Onward Movement, and Integration functions.

There are other programs available, which also provide logisticians the resources needed to accomplish specific tasks including movement planning, air load planning, and

others. These programs, although critical to the success of the overall logistics mission, provide a focused look at unit tactical movement planning and are deliberately excluded from inclusion into COSCOM Planner Version .01B.

Along with the software, numerous field manuals (FMs), supply bulletins (SBs), and other resources provide logistics planners projections for consumption and capability. The next sections provide a look at the literature by OPLOG and TACLOG functions.

### Operational Logistics Functions

Field Manual 100-10, *Combat Service Support (I-II)*, identifies the operational level of logistics as the link between the strategic and tactical levels. The main functions of logistics at this level include reception, staging, onward movement, and integration (mostly a unit function); materiel distribution (including battlefield distribution and infrastructure development); allocation, management, and redeployment of units and soldiers; reconstitution; combat health support and Class VIII (medical materiel) management; and positioning and security of CSS activities. Of all these activities, the logistics planner can readily assess mathematically reception capabilities, staging capabilities, onward movement time requirements, distribution capabilities, and redeployment. (Combat Health Support and Class VIII management are considered tactical functions as well and are addressed under the tactical logistics functions.) Redeployment is not specifically discussed in the computer model; however, the inverse results of the deployment model equate to the redeployment. (Reconstitution is most situation dependent and less easy to model and is therefore excluded.)

## Reception and Staging

For the operational logistics functions, FM 100-17-3, *Reception, Staging, Onward Movement, and Integration*, was critical to this research. Appendix M, which provided the reception and staging information, was especially useful for determining approximate staging requirements for analysis. Table 2 was included in COSCOM Planner Version .01B.

## Onward Movement and Battlefield Distribution

An additional aspect of operational logistics, is the onward movement component of RSOI and the battlefield distribution functions of the operational level of logistics. One of the most important resources for analysis of reception and throughput in this project was Field Manual 55-15, *Transportation Reference Data*. FM 55-15 provided movement tables necessary to determine capabilities and throughput for air, ground, rail, and port operations. Other Field Manuals, which provided both background information and unit capabilities for the computer program included FM 55-9, *Air Movement Planning*, Field Manual 55-20, *Army Rail Transport Units and Operations*, Field Manual 55-50, *Army Water Transport Operations*, and Field Manual 55-60, *Army Terminal Operations*. Seaport, airport, Inland Waterways (IWW), and ground distribution networks became pivotal parts of COSCOM Planner Version .01B.

Table 2 extracted from FM 100-17-3 provides useful information for determining reception and staging requirements. Although very simplistic when compared to some of the sophisticated techniques for evaluating fuel, ammunition, and major end item

consumption, this table proved useful in determining Short Ton (STON) capability, square footage, etc. for the RSOI process. (Some of the table columns are not depicted.)

Table 2. Information for determining reception and staging requirements

Type Unit	Personnel	Square Feet	Short Tons	Road, Self-Propelled Vehicles	Road, Towed Vehicles	Non-Road Vehicles
Air Assault Division	16,593	1,034,589	35,503	3,453	2,360	163
Airborne Division	13,198	755,300	25,783	2,731	1,588	171
Armored Division	17,186	1,484,636	101,342	3,662	2,312	83
Light Infantry Division	11,520	560,284	18,122	1,987	1,158	71
Mechanized Infantry Division	17,407	1,484,873	100,128	3,654	2,321	83
Armored Cavalry Regiment	4,555	433,658	31,267	1,056	545	21
Armored Brigade	4,203	347,954	27,854	811	436	16
Infantry Brigade	3,902	192,311	7,992	992	450	17
Mechanized Brigade	4,445	349,176	26,649	812	472	16

### The Tactical Logistics Functions

According to Student Text 63-1, *Division and Corps Logistics*, the primary tactical logistics (TACLOG) functions include manning, arming, fueling, fixing, moving, and sustaining (1-1). Each one of these TACLOG functions provided input into COSCOM Planner Version .01B and will be discussed separately as each contains several sub-components.

#### Manning the Force

The manning functions include personnel readiness management, reconstitution, personnel accounting and strength reporting, casualty operations management, and replacement management (ST 63-1, Chapter 8). The primary manning function modeled in COSCOM Version .01B and other software is replacement management. Unit replacement rate capabilities were derived from the Basis of Allocation found in Student Text (ST) 101-6, *G1/G4 Battle Book*, while replacement requirements derived from sources discussed later under the sustaining function of Combat Health Support. Capabilities for other manning functions derived from ST 101-6 as well. A quick synopsis of the basis of allocation for the manning functions is provided in table 3.

Table 3. Basis of allocation for the manning function

Unit	Basis of Allocation
Theater Personnel Command (PERSCOM)	One per theater
Replacement Battalion	One per theater
Personnel Group	One per division and One per theater

Personnel Services Battalion	One per six personnel detachments
Personnel Detachment	One per 6,000 soldiers and civilians
Replacement Company	One per 400 replacements

### Arming the Force

One of the more difficult modeling areas, the arming TACLOG function for COSCOM Planner Version .01B considered OPLOG Planner's database as well as FM 101-10-1 Volume 2, FM 55-15, and ST 101-6. (The Logistics Estimate Worksheet provides no method for calculating ammunition requirements.) These resources directly conflict with each other in calculating short tons of ammunition required for sustainment. According to OPLOG Planner, the short tons required to support an air assault division in the attack in Northeast Asia for one day totals 158.86 STONs plus 30.72 STONs for bulk ammunition for a total of 189.58 STONs. (See the figures following this discussion). The ST 101-6, which derives its data from OPLOG Planner, suggest that the STONs are actually 349.3; however, this is true only if the echelon for the air assault division is listed as "company" instead of "division!" This fact is illustrated in the figures following this section; however, this basic error makes the ammunition data in the *G1/G4 Battle Book*, suspect. Unfortunately, Field Manual 55-15 provides a different view of the situation. Field Manual 55-15 suggests that actual consumption for an air assault division for one day totals 847 STONs, a threefold difference over the OPLOG Planner numbers; however, this field manual does not base its consumption on unit posture. Even more complicated is the evaluation of FM 101-10-1, Volume 2, which suggests (using slightly



outdated data unfortunately) that the air assault division will actually consume 1,572 STONs on the first day of an attack, 1,297.8 STONs on succeeding days, and 808.9 STONs during protracted operations (2-132). Which source is accurate? The true answer is none of these sources provide real resolution to the problem; however, the ST 101-6 provides calculations based on the wrong echelon (a significant error) (1-5), while the Field Manual 101-10-1 is too outdated for use. With this in mind, COSCOM Planner Version .01B uses OPLOG Planner data, which may be artificially low. However, OPLOG Planner is currently approved by Combined Arms Support Command and is therefore the default data set. Also, OPLOG Planner bases ammunition consumption on theater, posture (attack, defend, etc.), Line Item Number (LIN), and Department of Defense Identification Code (DODIC), while FM 101-10-1 bases consumption rates only on unit, posture, weapon system, and ammunition. Neither methodology is perfect.

Capabilities for arming derive from the modified tables of organization and equipment (MTOEs) provided by ST 101-6 and Field Manual 9-6, *Munition Support in a Theater of Operations*. For ammunition units, unit capabilities are expressed in the number of STONs of ammunition that the unit can store, receive, issue, process, reconfigure, and distribute daily. (NOTE: COSCOM Planner Version .01B also accepts RSR and CSR input for evaluation of shortages based upon anticipated basic loads.)

Figure 4 is the Class V consumption rate generated by OPLOG Planner for an air assault division in the attack in Northeast Asia (Korea) for one day appears to be very low when compared to other resources (add 30 STONs for bulk consumption); however, these numbers are the approved solution by CASCOM. The screen snapshots show the

entire projected STONs based upon OPLOG's projections and the mission parameter set assigned to the order. Note that the company echelon screen snapshot exactly matches the *ST 101-6* estimation of STON usage for an air assault division in the attack in Northeast Asia. This error invalidates the table provided in the student text. Although OPLOG provides more capability than pure tables, its value in estimating STONs may be suspect.

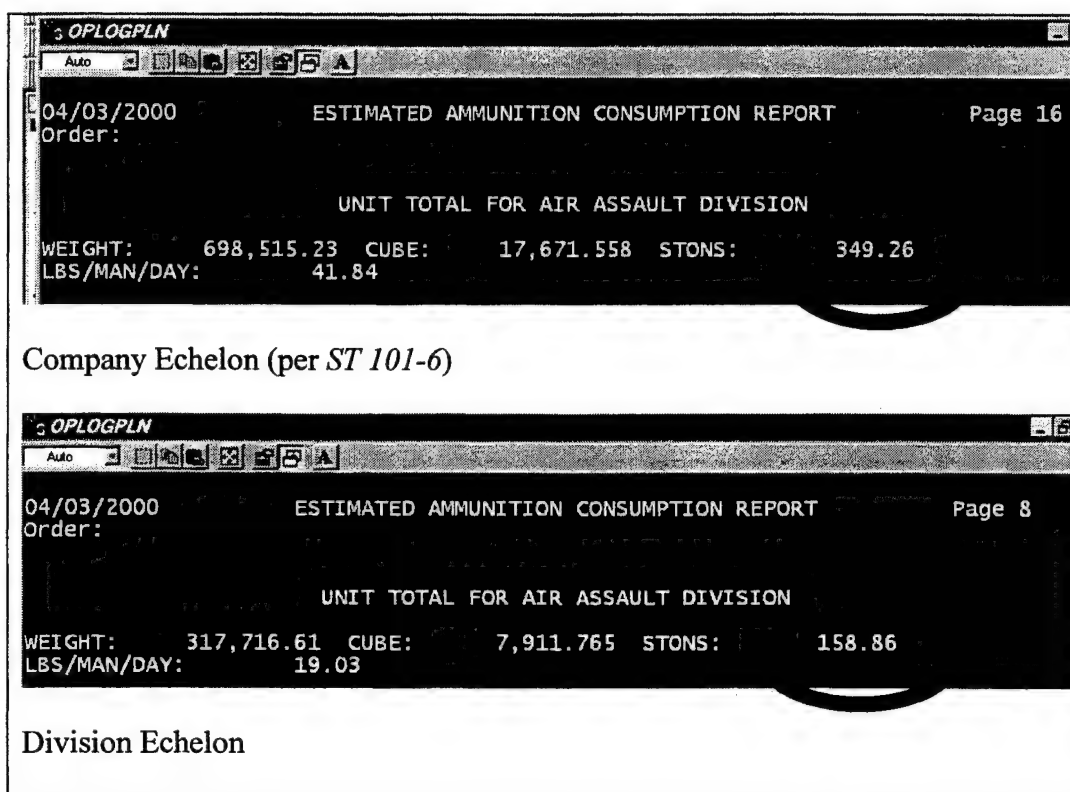


Figure 4. Class V Consumption Rate.

Table 4. Simplistic View of Class V Consumption

Type of Division	Class V
Armored (M1)	1,452 STONs per day
Infantry (Mechanized-M1/M2)	1,442 STONs per day
Light (LID)	651 STONs per day
Airborne	677 STONs per day
Air Assault	847 STONs per day

Note: Field Manual 55-15 (C-5) provides this simplistic view of Class V consumption. The 847 STON figure is vastly different than the OPLOG Planner projections.

### Fueling the Force

COSCOM Planner Version .01B borrows OPLOG Planners data source for calculating fuel consumption as well. OPLOG Planner provides a profile-dependent analysis of fuel consumption, which is both useful and relevant. Field Manual 55-15 provides a simplistic table for calculations (see Table 5); however, these calculations are not dependent upon profile configuration

Table 5. Simplistic View of Class IIIB, Class V, Class VII, and Class IX Consumption

Type of Division	Class III Bulk
Armored (M1)	606,940 gallons per day
Infantry (Mechanized-M1/M2)	580,067 gallons per day
Light (LID)	69,488 gallons per day
Airborne	102,783 gallons per day
Air Assault	270,196 gallons per day

Instead of the simplistic table, OPLOG Planner provides a robust method for evaluating fuel usage based upon usage profiles. The usage profiles result in varying usage rates by area of the world, although the usage is not affected by mission posture, which reduces its usefulness. Nevertheless, OPLOG Planner derives its methodology from FM 55-15 and is the source for COSCOM Planner Version .01B. Through sophisticated lookup and macro updates of pivot tables, COSCOM Planner Version .01B successfully incorporates this data as will be illustrated further in chapter 4. The calculated fuel consumption from OPLOG Planner is 353,840.42 gallons per day, which represents a 31 percent increase over the values provided by FM 55-15; however, OPLOG Planner evaluates usage by equipment and by profile, which is superior methodology than a simple table. In this case, the ST 101-6 exactly matches the OPLOG Planner calculations (353,840 gallons) (1-4). Figure 5 is the OPLOG Planner solution for fuel consumption.

In figure 5, the OPLOG Planner suggests a consumption rate 31 percent higher than *FM 55-15*. (NOTE: The tank capacity listed does not reflect the ability of equipment to store fuel for use by other end items. The tank capacity reflects the organic capability of equipment to hold fuel for itself. This fact was verified through dissection of the OPLOG database and inspection of fuel handling LINs.)

OPLOGPLN

Auto

04/03/2000

ESTIMATED BULK POL CONSUMPTION REPORT

Page 1

Order: 99-02 testing this out

Phase: 1 Phase Length: 1.00 Days

Unit: 67000A000 AIR ASSAULT DIVISION

Qty: 1 Str: 16,696

ORDER SUMMARY FOR PHASE 1

	TANK CPCTY	CONSUMPTION	WEIGHT
JP8:	101,262.00	274,815.20	1,803,612.16
DSL:	182,830.60	51,116.33	357,405.38
MOG:	4,292.00	27,908.89	173,118.84
TOTAL:	288,384.60	353,840.42	2,334,136.38

Figure 5. Estimate bulk POL consumption report.

For pipeline distribution, Field Manual 55-15 proved to be an exceptionally useful source. Table 6 was incorporated into the COSCOM Planner model as well.

Capabilities of supporting units were derived from two sources. Again, the ST 101-6 proved exceptionally useful for basis of allocation and capabilities. Field Manual 10-67, *Petroleum Supply in Theaters of Operations* also proved invaluable for determining theater requirements.

Table 6. Rail and pipeline distribution capacity

CARRIER	CAPACITY (gal)	JP-8 (STONs)
Pipeline <sup>1</sup> 6 inch	719,880 per day <sup>2</sup>	3,500
Railroad tank car	8,000; 10,000; 12,000	24.1; 30.6; 36.8
Semitrailer, 12 ton, 4W	5,000	15.3
Tank, portable fabric <sup>3</sup>	10,000	30.6
<sup>1</sup> In maintaining the same volumetric pipeline capacity for gasoline and oil, more pressure is required for the heavier liquid. <sup>2</sup> Based on 6-inch IPDS (inland petroleum distribution system), 35,994 per hour for 20 hours of operation. In an emergency it can deliver 48,006 gallons per hour for 24 hours of operation or 1,152,144 gallons per day. <sup>3</sup> When full, 40 feet long, 12 feet wide, 3 feet high. When empty, it can be rolled to 20 inches by 12 feet; 10 can be carried in a 6 x 6 truck.		

### Fixing the Force

The TACLOG function of fixing the force is a combined analysis using the estimated vehicles involved from OPLOG Planner data and ST 101-6. Because of the nature of mechanical breakdowns, prediction models are suspect at best; nevertheless, planning figures provide an estimation of remaining vehicle strength for warfighters. OPLOG Planner does provide a complete Class VII estimate (major end items), but no estimate for force maintenance requirements and no analysis of remaining vehicle strength over time. The ST 101-6 provides four tables for determining the loss rates, type

of loss (repairable or non-repairable), repair time estimations, and helicopter repair estimations (1-6 and 1-7). These tables served as the basis for inclusion into COSCOM Planner Version .01B (separate maintenance estimate).

Another part of fixing the force is Class IX (repair parts). Class IX consumption rates from ST 101-6 suggest that the appropriate rate is 2.5 pounds per man per day. This figure agrees perfectly with FM 101-10-1, Volume 2, with a minor exception of a change dated 17 July 1990. This change adds a modifier to the 2.5 figure based upon chemical defense equipment (CDE) requirements and theater of operation. The modifier is nominal (between .085 to .155 depending on theater). OPLOG Planner provides no planning numbers for Class IX consumption at all. Also, FM 55-15 does not provide information regarding Class IX consumption. (The ST 101-6 suggests that the source for the 2.5 pounds per man per day is OPLOG Planner Version 2.01; however, this source is in error as OPLOG produces no Class IX estimate.) For purposes of COSCOM Planner, consumption rates are modeled after the primary existing source (FM 101-10-1 Volume 2), and the additive weight for CDE is included as well.

Capability analysis for fixing the force is simplified as the units are generally authorized based upon force structure instead of workload. Student Text 101-6 provided the primary input for evaluating capability.

#### Moving the Force (Tactical Lift)

Battlefield distribution requirements were derived primarily from short ton (STON) calculations in FM 55-15 and ST 101-6. Each supply class generates a requirement for movement, which converts to either gallons or STONs. The specific unit

capabilities for moving STONs are found in FM 55-15 and ST 101-6. By applying the task vehicle availability rate (TVAR) found in table 7, the actual capability of units to haul equipment can be calculated after obtaining user input concerning percent of local versus line haul and percent truck company desired. The TVAR rates reflect "the average of the percentage of task vehicles available for mission accomplishment over time." (FM 55-15, C-2). The TVAR rates from FM 55-15 are provided below.

Table 7. TVAR Rates

Type Unit	Standard Requirements Code	Task Vehicle	Task Vehicle Availability Percent
Medium Truck Company, Echelons Above Corps Cargo	55727L100	M915	87.5%
Medium Truck Company, Corps Cargo	55728L100	M931	84.7%
Light Medium Truck Company, Corps	55719L200	M923	85.9%
Light Medium Truck Company, Corps	55719L200	M923A1	91.2%
Medium Truck Company, Palletized Loading System (PLS) Cargo	55728L300	PLS	90.5%

Army aviation lift is not a calculated component of COSCOM Planner Version .01B. Determining aircraft availability based upon competing missions, weather, etc. precludes useful analysis. The logistician will need to plan this component separately.



## Sustaining the Force

Sustaining the force consists of multiple components. According to ST 63-1 (chapter 9), these components include personnel service support (PSS), combat health support (CHS, which also appears at the operational level of logistics), general supply support (GSS), and field service support (FSS). Each one of these requires evaluation.

### Sustain: Personnel Service Support

Personnel Service Support functions are delineated in ST 63-1 and include:

1. Personnel services (postal operations; essential personnel services; and Morale, Welfare, and Recreation (MWR) services),
2. Personnel information management,
3. Resource management functions,
4. Finance operations (procurement, banking and currency support, currency control, United States pay support, non-United States pay support),
5. Religious support, and
6. Legal support.

Of these services, postal operations and finance operations are relevant for modeling. Postal operations generate a significant amount of STONs for inclusion in battlefield distribution calculations, while the capability to handle those STONs can be determined from OPLOG Planner. OPLOG Planner suggests a planning figure of 1.34 pounds per man per day.

Finance units are assigned based upon force structure instead of workload and can easily be measured in any programming model (see table 8), while religious personnel are

generally included in the MTOEs of units and have no additive units for inclusion in modeling. Force Provider is the primary MWR unit included in COSCOM Planner Version .01B as a potential selection.

Table 8. The Basis of Allocation for Finance Units Generated Requirements for COSCOM Planner Version .01B

Unit	Basis of Allocation
Finance Command	One per theater
Finance Group	One per corps or Theater Army Area Command
Finance Battalion	One per two to six Finance Detachments
Finance Detachment	One per 6,000 supported soldiers

Sustain: Combat Health Support

The sustain function of CHS includes several subordinate functions described in Field Manual 8-10, *Health Service Support in a Theater of Operations*. These functions include evacuation, treatment and hospitalization, health service logistics, medical laboratory services, blood management, veterinary services, preventive medicine, dental services, combat stress control, and medical command and control (2-13). Of these functions, all can be included for analysis either via force basis of allocation or workload basis of allocation. Although each "Medical Battlefield Operating System" component is important, most of the force structure determinations can be based upon force structure instead of casualty estimations. With this fact in mind, COSCOM Planner Version .01B uses primarily force structure basis of allocation methodology vice casualty estimation methodology in proffering force structure recommendations (with the major exception of medical logistics planning). Nevertheless, casualty estimations are critical to other

components of the model (including replacement analysis) and a discussion of these estimations is provided below.

As mentioned previously, Field Manual 8-55, *Health Service Support Planning*, and ST 101-6 provided two of the sources for calculation of casualties and capabilities; however, a third source proved interesting as well. *The Chairman of the Joint Chiefs of Staff (CJCS) Guide 3161 CJCS Guide to Battle Casualty Rate Patterns for Conventional Ground Forces* provided an alternate source for casualty rates. *The CJCS Guide 3161* is now the approved methodology for calculating casualty rates in the Department of Defense; however, one must anticipate the capacity of the enemy and pre-determine the likely outcome in order to fully use the system. Nevertheless, COSCOM Planner Version .01B is the first and only program to include the tables from *CJCS Guide 3161* as a programming option for planners.

Part of Combat Health Support is medical logistics, which can also be considered a General Supply Support function. Calculations for Class VIII (medical logistics) generally derive from ST 101-6 and the Army Medical Department Center and School. Consumption generally varies based upon theater of operations and echelon. NOTE: FM 101-10-1, Volume 2, suggests that consumption of Class VIII nominally increases based upon chemical threat as well.

#### Sustain: General Supply Support

General Supply Support includes providing Class I (subsistence), Class II (components of sets, kits, and outfits; tentage; chemical defense equipment), Class IIIP (packaged Petroleum, Oil and Lubricants), Class IV (construction and barrier materiel),

Class VI (personal demand items paid), Class VII (major end items, e.g., tanks), maps, and water.

The ST 101-6 provided critical input for evaluating GSS. This source coupled with Appendix C of FM 55-15 and OPLOG Planner served as the primary resources for both GSS consumption analysis and some other TACLOG (tactical logistics) functions. Even in this simple area, the values differed between sources. Both OPLOG Planner and ST 101-6 were in perfect harmony when analyzing supply consumption rates for the air assault division; however, FM 55-15 used higher water consumption rates (7.0 vice 6.5 gallons per man per day for a division in a temperate climate) in determining requirements. Both FM 55-15 and ST 101-6 reference FM 10-52, *Water Support in Theaters of Operation* from October 1990, so a simple check of the reference revealed the issue. Field Manual 10-52 (Appendix B, Table B-1) supports the results of FM 55-15 instead of either OPLOG Planner or ST 101-6. A quick comparison of additional rates for company, battalion, brigade, division, and above division suggest some discrepancies, which are not easily explained as the ST 101-6 refers to FM 10-52 October 1990. Which source is more accurate and more usable? Because OPLOG Planner is generated at Army's center of logistics excellence and has been updated more recently than FM 10-52, the tables from OPLOG Planner are included as the basis for COSCOM Planner Version .01B; however, table 9 from FM 10-52 and table 10 from ST 101-6 are included for comparison.

Table 9. Temperate Zones-Sustaining and Minimum

Function	Sustaining	Minimum
Drinking	1.5	1.5
Personal Hygiene	1.7	1.0
Field Feeding	2.8	.8
Division-level medical treatment	.4	.4
Subtotal	6.4	3.7
10% waste	.6	.4
Total	7.0	4.1

Note: For temperate zones, FM 10-52 suggests a consumption rate of 7.0 (sustaining) and 4.1 (minimum). These numbers conflict with the rate from OPLOG Planner and ST 101-6.

Table 10. Temperature Zone Comparison

Water (Gallons per man per day)	Temperate	Arctic	Tropic	Arid
Company	4.1	4.6	5.7	5.9
Battalion	6.1	6.6	7.7	7.9
Brigade	6.5	7.0	8.1	8.3
Division	6.5	7.0	8.1	8.9
Above Division	7.7	8.2	9.3	20.3

Note: For comparison, an exact extract of ST 101-6 is provided (1-4). Note the discrepancies between this table and the previous one.

For the majority of the other supply classes, planning tables were generally in agreement; however, there were differences. For example, FM 55-15 reports that Health and Comfort Packs (Type I) are consumed at the rate of .77 pounds per man per day whereas ST 101-6 reports the consumption at .137 pounds per man per day. For Health and Comfort Packs (Type II), FM 55-15 reports a consumption rate of .055 pounds per man per day whereas ST 101-6 reports the consumption at .009 pounds per man per day.

OPLOG Planner supports the ST 101-6 figures in both cases. For Class IIIB consumption, the rate of .51 pounds per man per day is not universally accepted. Although FM 55-15, OPLOG Planner, and ST 101-6 agree that .51 pounds per man per day is appropriate, none of the sources consider the modifier for chemical defense equipment (CDE). This modifier is nominal but included in COSCOM Planner Version .01B. Tables 11 and 12 illustrate the discrepancies.

Table 11. Planning Tool for GSS Consumption Analysis

CLASS OF SUPPLY	PLANNING FACTOR				SOURCE
Class I - A-RATION	2.549 lb/man/day				SB 10-260, FM 10-13
B-RATION	1.278 lb/man/day				SB 10-495
T-RATION	2.575 lb/man/day				NATICK PAM 30-2
MRE	1.570 lb/man/day				NATICK PAM 30-2
LRP(I)	1.250 lb/man/day				NATICK PAM 30-2
R/CW	2.750 lb/man/day				NATICK PAM 30-2
HCP1	.770 lb/man/day				NATICK PAM 30-2
HCP2	.055 lb/man/day				NATICK PAM 30-2
EXAMPLE RATION POLICY:					
1A + 1T + HCP1 + HCP2 = 7.52 lb/man/day (D-DAY to D+60)					
1A + 1T + _____ + _____ = 6.69 lb/man/day (after D + 60, AAFES in Theater)					
Class II -	3.17 lb/man/day				FM 101-10-1/2 (1987) (See * below for CDE)
Class III (packaged) -	.51 lb/man/day				SB 710-2, Jan 91
Class IV -	8.50 lb/man/day				FM 101-10-1/2 Made up of 4.0 barrier material & 4.5 base construction
Class VI - (After D+60)	2.06 lb/man/day (temperate) 3.40 lb/man/day (trop/arid)** 1.75 lb/man/day (arctic)**				AAFES Exchange Service Regulation-8-4 Change 1, Mar 93
Class VIII (lb/man/day) - Division	INT	MOD	LIGHT	RES	AMEDD Center and School (1992)
Non-Division	.65	.46	.28	.14	
Theater	1.46	1.04	.63	.31	
	1.55	1.10	.67	.33	
Water (gal/man/day)					FM 10-52 (1990)
	TEMPERATE	ARCTIC	TROPIC	ARID	
Company	3.9	4.4	5.7	5.9	
Battalion	6.6	7.2	8.5	8.7	
Brigade	7.0	7.6	8.9	11.1	
Division	7.0	7.6	8.9	11.9	
Above division	7.8	8.4	9.9	18.4	

Source: FM 55-15.

Table 12. Planning Tool for GSS Consumption Analysis

Class I				
A-ration		2.549 lbs/meal	SB 10-260 & FM 10-13	
B-ration		1.278 lbs/meal	SB 10-495	
T-ration		2.575 lbs/meal	Natick Pam 30-2	
MRE		1.860 lbs/meal	Natick Pam 30-2	
LRP		1.250 PMD	Natick Pam 30-2	
R/CW		2.750 PMD	Natick Pam 30-2	
HCP1		0.137 PMD	Natick Pam 30-2	
HCP2		0.009 PMD	Natick Pam 30-2	
Class II				
Southwest Asia (SWA)		2.091 PMD	ATCOM Study, Mar 94	
Northeast Asia (NEA)		3.367 PMD		
Class III package (IIIp)				
		0.51 PMD	SB 710 2, Jan 91	
Class IV				
	NEA	9.92 PMD	CERL, Mar 95	
	(Construction (Con) = 3.67; Barrier (Bar) = 6.25)			
	SWA	8.09 PMD	CERL, Mar 95	
	(Con = 3.8; Bar = 4.29)			
Class VI (after D + 60)				
		2.06 PMD Temperate	AAFES Reg 84	
		3.40 PMD Trop/Arid**	AAFES Reg 84	
Class VIII (PMD)				
	Ech 1/2 (Div)	Ech1/2/3 (Cbt Zone)	Theater (Army)	Theater AMEDD Center (Joint) School Ltr, 26
MTW-E (SWA)	1.47	0.88	0.72	0.75
MTW-W (NEA)	1.10	0.79	0.80	0.84
Class IX				
		2.5 PMD	OPLOGPLN 2.01	

Note: The sources listed by the Student Text are not all accurate. Field Manual 101-10-1, *Staff Officers' Field Manual*, Volumes 1 and 2, provided a source for determining consumption rates as well.



Capabilities for these supply classes are specified in MTOE documents and provided in the ST 101-6. Specific capacities are based upon 100 percent unit strength.

For Class VI consumption, Army Air Force Exchange Services Regulation 8-4, *Emergency Operations*, provided input for determining personal demand item (PDI or Class VI) consumption rates. NOTE: Class VI rates vary based upon climate; however, no arctic rates are available, so mean rates were substituted. Capabilities were determined based upon ST 101-6.

The Institute for Defense Analysis Study on Chemical Defense Equipment (1986-1988) provided chemical defense modifiers. This information was useful in determining short tons. Capabilities (again) were available in ST 101-6.

The absence of Class VII immediately raises questions about the methodology for calculating requirements. Through advanced queries of the OPLOG Planner database, consumption rates by LIN were available for use. For an air assault division in Northeast Asia in an attack profile, OPLOG Planner suggested a consumption rate of 13 pounds per person (see figure 6). A simpler planning figure is provided by FM 101-10-1 Volume 2. This source suggests that a good planning figure is 15 pounds per person per day (2-5); however, this planning number does not vary by scenario. Another resource is FM 55-15, which provides the table immediately following this section, and suggests that 23.7 pounds per person is appropriate. Again, three competing figures provide significantly different answers. Because of superior methodology, OPLOG Planner will eventually provide the input into COSCOM Planner Version .01B (see chapter 3). OPLOG Planner

considers theater, LIN, posture, and others whereas the other sources do not.

Nevertheless, it is interesting to note the significant differences between resources.

Table 13. Class VII Consumption Rate

Type Division	Class VII
Armored Division (M1)	572 STONs per day
Infantry (Mechanized-M1/M2)	538 STONs per day
Light Infantry Division (LID)	78 STONs per day
Airborne Division	119 STONs per day
Air Assault Division	198 STONs per day

Note: The table above suggests a consumption rate of about 23.7 pounds per person (based on 16,696 personnel in the air assault division) as opposed to the planning rate of 15 pounds per person proffered in FM 101-10-1 Volume 2 (2-5). The difference between the two planning figures is significant.

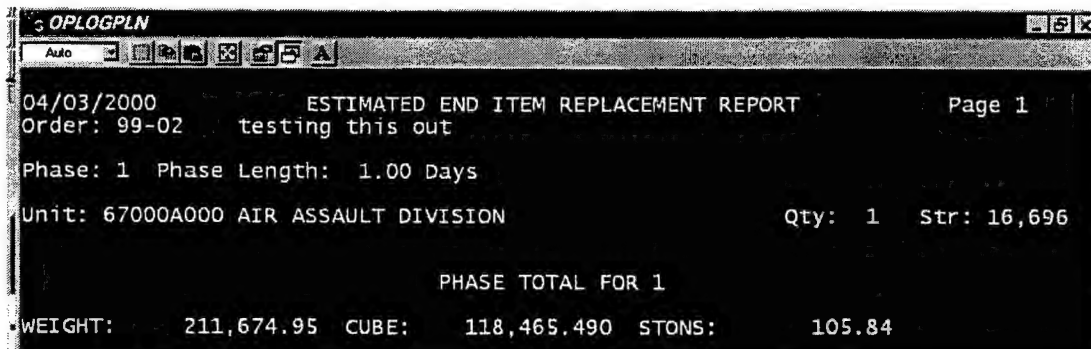


Figure 6. OPLOG Planner suggests a consumption rate of 105.84 short tons or 12.7 pounds per person, the lowest consumption rate of all three resources.

Capabilities for Class VII replacement are specified in the MTOE for the Quartermaster Heavy Materiel Supply Company in ST 101-6.

Map consumption is a component of GSS as well; however, for purposes of COSCOM Planner Version .01B, the consumption rate is considered nominal and not included in STON calculations. NOTE: The Quartermaster Map Supply Platoon is included as a potential unit for supporting operations.

#### Sustain: Field Service Support

Field services include the Army Field Feeding System (AFFS), Mortuary Affairs (MA), airdrop, laundry and shower support, clothing and light textile repair, and water purification (ST 63-1, 9-26). Of these field services, all were included in determining requirements and force structure recommendations in COSCOM Planner Version .01B. For example, airdrop support units are recommended in the force structure for contingencies involving airborne divisions.

#### Summary of Literature Review

The amount of literature supporting consumption rates and capabilities for military units is phenomenal. The key task is organizing the information into usable software. COSCOM Planner Version .01B seeks to fill this void. Overall, table 14 compares information sources using the scenario of one air assault division in Korea (attack profile, Northeast Asia posture, temperate climate, one-day operation) with a ration cycle of one A-ration and two meals ready to eat (MREs). All other factors are kept constant. The differences are rather interesting.

Table 14. Consumption Rate Comparison

	OPLOG Planner	<i>ST 101-6</i>	<i>FM 55-15</i>	LEW	<i>FM 101-10-1 Rates</i>
RSOI Estimate	No	No	Provides data	No	No
Manning Estimate	No	Provides Data	No	Yes (based on <i>ST 101-6</i> )	Yes (based on World War II rates)
Arming Estimate	Yes	Provides wrong data	Planning figure	No	Yes
Fixing Estimate (excluding Class IX)	No, but a related Class VII estimate	Provides planning data for some major units	No	Yes	No
Fueling Estimate	Yes	Provides a table	Provides a table for divisions	After self- calculation of vehicles	

Note: The table above suggests that significant differences exist in the focus of the data sources. Since CASCOM supports OPLOG Planner, the planning figures for COSCOM Planner Version .01B are generally derived from that source; however, OPLOG Planner does not support RSOI, manning, fixing, or personnel estimates. These estimates are derived from ST 101-6 and other resources.

Table 15. Differences in the Planning Figures of the Data Sources

	OPLOG Planner	<i>ST 101-6</i>	<i>FM 55-15</i>	LEW	<i>FM 101-10-1 Rates</i>
Class I (Rate)	5.689 PMD		5.689 PMD	Specified as delivery requirements	4.03 PMD
Class II (Rate)	3.367 PMD	3.367 PMD	3.17 PMD	N/A	3.67
Class IIIP (Rate)	.51 PMD	.51 PMD	.51 PMD	N/A	.59
Class IIIB (Total)	353,840 GMD	353,840 GMD (table)	270,196 GMD	Must know vehicles by type	53.7
Class IV (Rate)	9.92 PMD	9.92 PMD	8.5 PMD	N/A	8.5
Class V (Total)	158.86 STONs (less bulk)	349.3 STONs (less bulk)	847 STONs	N/A	1572.2 STONs day 1, 1297.8 day 2 and on
Class VI (Rate) (after 60 days)	2.06 PMD	2.06 PMD	2.06 PMD	N/A	3.2 PMD
Class VII (Total)	105.84 STONs	N/A	198 STONs	N/A	125.22 STONs
Class VIII (Rate)	1.1 PMD	1.1 PMD	.65 PMD (Intense combat)	N/A	1.22
Class IX (Rate)	No Calculation	2.5 PMD	2.5 PMD	N/A	2.50
Water (Rate)	6.5 GMD	6.5 GMD	7.0 GMD	6.0 GMD	7.0 GMD (Min)
CDE Modifier	N/A	3.27 PMD	N/A	3.27 PMD	3.27 PMD
Postal (Rate)	1.34 PMD	N/A	N/A	N/A	N/A

Note: The table above suggests that significant differences exist in the planning figures of the data sources. Since CASCOM supports OPLOG Planner, the planning figures for COSCOM Planner Version .01B are generally derived from that source.

## CHAPTER 3

### RESEARCH AND PROGRAM DESIGN

#### Design Considerations, Tools, and Process

The overall design for COSCOM Planner Version .01B involves the dissection of OPLOG Planner, the inclusion of logistical planning data from the manuals discussed in the literature review, and the inclusion of ancillary data from other resources. The end state (research question) remained the focus for the research design phases. The operational and tactical levels of logistics serve as the framework for discussion of COSCOM Planner Version 0.1B's design, while a simple utility matrix will evaluate the outcome of the design phase.

#### Program Language

The researcher considered various alternatives for programming the software including Visual Basic, Java, C, Microsoft Access with Visual Basic for Applications, and Microsoft Excel with Visual Basic for Applications. The best solution may have been Java as it supports multiple operating systems (UNIX, Microsoft Windows, etc.); however, due to time constraints and calculation power, the researcher selected Microsoft Excel and Visual Basic for Applications.

#### Baseline Algorithm

The simple algorithm for producing COSCOM Planner Version .01B follows. Step one was to determine the user input required and build the user interface. Step two was to build the logistical requirements tables linked to the user input. Step three involved building unit capability tables linked to logistical requirements. Step four

involved building personnel and logistics estimates tables linked to all other input. Step five involved model validation and end user testing; however, the end user testing portion of step five is specifically delimited. (NOTE: At all times, logistics and personnel estimates would need to be continually updated to allow for analysis of the selected force package and to provide sensitivity analysis.) Step six evaluated the usefulness of the program using a simple utility (decision) matrix. By evaluating the criteria of speed, size, ability to assess unit capabilities, ability to determine shortfalls, ability to assess days to reach stockage levels, ability to provide personnel estimates, ability to evaluate terminal throughput, and user friendliness, the usefulness of the program could be determined.

#### Step One: Determine the Required User Input

Because of the myriad of variables required by OPLOG Planner, ST 101-6, and other sources, the user entry forms are necessarily long. Like OPLOG Planner, the calculations are based upon unit mission profiles, MTOEs, and other variable parameters. All of these variables had to be included in the design. In addition, questions pertaining to RSOI were required in order to answer questions at the operational level of logistics. Simplifying the amount of input required to answer the tactical questions became problematic; however, the results are shown in figures 7, 8, and 9.

Master Menu		Task Organization Generics			
Reset Task Org		<b>Task Organization</b>		<b>Location Data</b>	
		# of Theaters	1	# of LSAs	1
		# of Corps	1	# of RAOs	2
Enter Initial Info		# of Divisions	1		
Enter OPLOG Info		# of Man. Bde	3		
Enter Cbt Task Org				<b>Personnel Data</b>	
Calculate Consumption		# Airborne Div	1	% Strgth Cbt Arms	1
		# AA Divisions	1	% Strgth CS	0.95
		# Armor Divisions	0	% Strgth CSS	0.9
		# Lt Inf Divisions	0	# of Replacements	400
		# Mech Divisions	0	Enemy Strength	30000
				Mil Working Dogs	0
CSS Task Org		# ACR		Set to Default Values	
OPLOG Estimate		# AR Brigades	0		
TACLOG Estimate		# Mech Brigades	0		
Man Estimate		# Lt Inf Brigades			
Arm Estimate		# AA Bde	3	<b>Meal Cycle</b>	
Fuel Estimate		# Separate Bde		A Rations	1
Fix Estimate		# Sep Abn Bde		B Rations	1
Move Estimate		# Sep LID Bde		T Rations	0
Sustain Estimate				MREs	1
Print		# of MLRS		UGH	1
		# of Av/Stgr Bns		UGC	1
		# of Avenger Bns		LRPS	0.01
		# of Patriot Bns		RCW	0.01
		# TACFIRE Radar		Set to Default Values	
				<b>Mission Data</b>	
				Theater	SWA
				Profile	MIDEAST
				Climate	TEMPERATE
				Posture	ATTACK
				Echelon	XX
				Days	Days 1 - 60
				Chem Tht?	YES
				Class 4C?	YES
				Set to Default Values	

Figure 7. COSCOM Planner Version .01B's master menu provides access to all the pertinent screens in the order in which user entry is required. The program provides a robust screen for entering generic task organization data. The screen supports friendly help notes accessible by holding the user mouse over the item of interest.





[illegible]

Figure 9. COSCOM Planner Version .01B provides an easy table for building task organizations. By looking up Standard Requirement Codes (SRCs-which are sorted by service branch), a user can simply paste the SRC into the task organization. Of great utility is the ability to subtract units from the task organization by entering a minus sign in front of the quantity. OPLOG Planner requires a complete delineation from the ground floor up.

## Step Two: Build Logistical Requirements Tables

Although this step may sound simplistic, the nature of linked tables complicated this task enormously. Each class of supply and each service linked to user input and various lookup tables. The end state became a series of lookup tables, which were bulky but hidden to the user. An example of a lookup table is table 16.

Table 16. Water Usage Depending on Echelon and Climate

Water Concatenation	Unit	Climate	Rate
COMPANYTEMPERATE	COMPANY	TEMPERATE	4.1
COMPANYARCTIC	COMPANY	ARCTIC	4.6
COMPANYTROPIC	COMPANY	TROPIC	5.7
COMPANYARID	COMPANY	ARID	5.9
BATTALIONTEMPERATE	BATTALION	TEMPERATE	6.1
BATTALIONARCTIC	BATTALION	ARCTIC	6.6
BATTALIONTROPIC	BATTALION	TROPIC	7.7
BATTALIONARID	BATTALION	ARID	7.9
BRIGADETEMPERATE	BRIGADE	TEMPERATE	6.5
BRIGADEARCTIC	BRIGADE	ARCTIC	7
BRIGADETROPIC	BRIGADE	TROPIC	8.1
BRIGADEARID	BRIGADE	ARID	8.3
DIVISIONTEMPERATE	DIVISION	TEMPERATE	6.5
DIVISIONARCTIC	DIVISION	ARCTIC	7
DIVISIONTROPIC	DIVISION	TROPIC	8.1
DIVISIONARID	DIVISION	ARID	8.9
ABOVE DIVTEMPERATE	ABOVE DIV	TEMPERATE	7.7
ABOVE DIVARCTIC	ABOVE DIV	ARCTIC	8.2
ABOVE DIVTROPIC	ABOVE DIV	TROPIC	9.3
ABOVE DIVARID	ABOVE DIV	ARID	20.3

Note: COSCOM Planner Version .01B used a series of lookup tables and concatenated strings to identify the appropriate columns and or rows. In this case, water usage varies depending on echelon and climate. By combining the two variables into a single, one-word variable and by combining the user's input into a one-word variable, the two variables could readily be matched and the appropriate value identified.

### Step Three: Build Unit Capabilities

One of the more challenging tasks of the program was determining the actual capabilities of units as units often are authorized based upon multiple sets of circumstances. Certain assumptions about usage and application were required; however, an example of the end state basis of allocation appears in figure 10.

#		16,696		Accept Recommended Task Org				Return to Main Menu	
SRC	Tally	Unit Name	Basis of Allocation	# of Units	Auth	Total Auth	Total OH	Required	Delta from BOA
12402L000	HHD, PERSONNEL GROUP		1/XXX	159		0	0	1.00	-1.0
12426L100	HQS, PERS SVCS BH		1/6 PDs	159		0	0	10.46	-0.5
12417L000	PERS DET, PERS SVC BH		1/6K	159		0	0	2.78	-2.8
12423L300	GEN SPT POSTAL COMPANY		1/36K	159		0	0	10.46	-0.5
12407L000	REPLACEMENT COMPANY		1/400Reps	159		0	0	1.00	-1.0
12113L000	DIVISION & ARMY BAND (DS)		1/XXX	159		0	0	1.00	-1.0
14412L000	FINANCE GROUP		1/XXX	159		0	0	1.00	-1.0
14426L100	HHD FIN BH		1/6FDs	159		0	0	0.46	-0.5
14423L000	FINANCE DETACHMENT		1/6K	159		0	0	2.78	-2.8
08422A100	HHC, MEDICAL BRIGADE		1/XXX	98		0	0	1.00	-1.0
08432L000	HHD, MEDICAL GROUP		3/XXX	64		0	0	3.00	-3.0
08518L000	MED TM, FORWARD SURGICAL		1/Man Bde	20		0	0	3.00	-3.0
08485L000	MEDICAL BH, LOGISTIC(FWD)		1/XXX	226		0	0	1.00	-1.0
08909L000	MED LOG SUPPORT DET		1/25000 joint svc troops in CZ	39		0	0	0.00	0.0
08705L000	COMBAT SUPPORT HOSPITAL		2.4/Division	602		0	0	2.40	-2.4
08455L000	MED BH, AREA SUPPORT		1/018 nondiv troops	334		0	0	0.30	-0.3
08458L000	MEDICAL COMPANY, HOLDING		1/XXX	241		0	0	1.00	-1.0
08446L000	HHD, MED EVAC BH		1/7 Companies	53		0	0	0.50	-0.5
08447L200	MED CO, AIR AMBL (UH-60A)		1 / div, 1/3 SIB&ACR, 1/2div	141		0	0	1.50	-1.5
08448L000	MED CO, GROUND AMBULANCE		1 / div, 1 per corps	116		0	0	2.00	-2.0
08476L000	HHD, MED BH, (DEN SVC)		1 / 3-8 subordinate dental	10		0	0	0.37	-0.4
08478L000	MED CO, DENTAL SVCS		1/20K troops	59		0	0	0.63	-0.8
08479L000	MED DET DENTAL SVCS		1/6K troops not sent by co	27		0	0	0.60	-2.1

Figure 10. The unit capabilities are indicated in the basis of allocation column. Using these capabilities, COSCOM Planner Version .01B generated a requirement for a logistical unit. This requirement then became a recommendation in green. By selecting the button "Accept Recommended Task Org," users can automatically generate a supporting logistics package for the task organization designed.

Step Four-Build Estimates

### Step Four: Build Estimates

Building estimates was relatively simple after determining the requirements and capabilities. By comparing the two and highlighting the differences, the estimates

provide instantaneous feedback about shortage areas based upon selected task organization. COSCOM Planner generated estimates for operational logistics and separate estimates for manning, arming, fueling, fixing, moving, and sustaining the force. The following figures are examples of the estimates provided in COSCOM Planner Version .01B. Because of the number of estimates and tables provided by COSCOM Planner Version .01B, only the major estimates and graphs are depicted in the following figures 11 through 19.

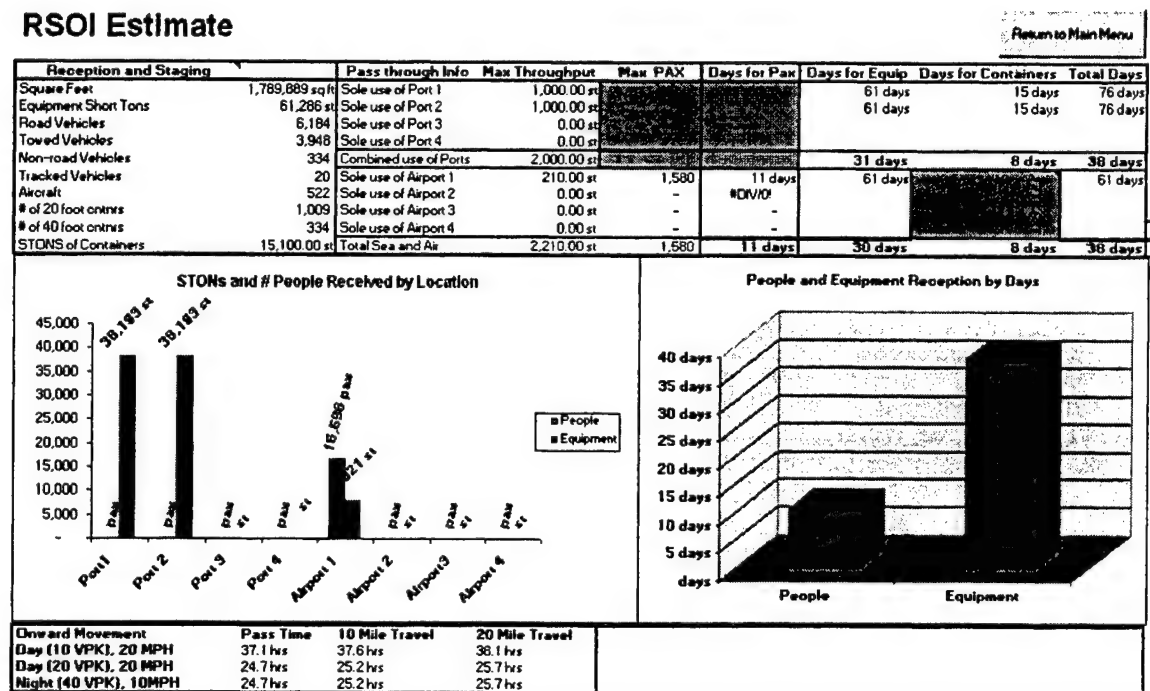


Figure 11. The operational logistics estimates provides reception and staging area requirements for the force package, including square footage, days to receive units, days for onward movement, etc. The value of this estimate is that logisticians can quickly determine whether the force can be integrated into the theater in accordance with the tactical plan.

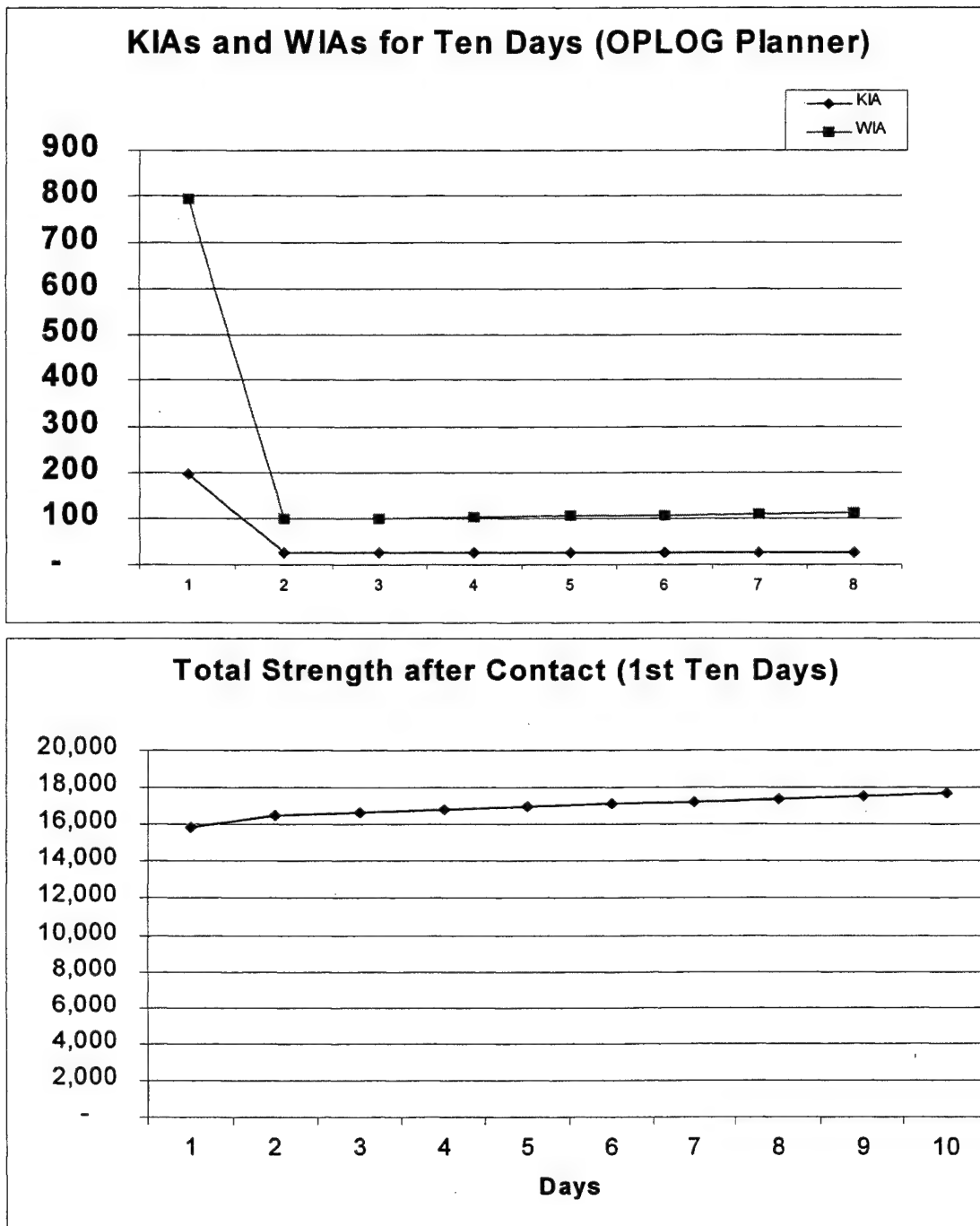


Figure 12. The graphs above are part of the first of two manning estimates. The personnel estimate predicts end strength based upon planning figures in the ST 101-6.

# CONTINUOUS FRONT CORPS DEFENSE MAIN ATTACK SECTOR TYPE II: MODERATE/LOW FLOT MOVEMENT

CONTINUOUS	# of Divisions	4	Division 1	20,000	5-00	0.0	0.0
MODERATE/LOW FLOT MOVEMENT	# of Total Days	40	Division 2	20,000	10-00	1.0	1.0
DEFENSE	Top 25% HS Range?	Yes	Division 3	20,000	10-00	0.75	0.75
10 DAY BATTLE			Division 4	20,000			
			XXX Sp	40,000			
			THX Fca	60,000			

TABLE DATA	HIGH T	MED T	LOW T	MAX W	MED W	MIN W	MAX	75 TH	50 TH	25 TH
XXX ME	25.00	20.00	10.00	0.30	0.34	0.31	0.00	1.44	0.40	0.00
XXX SE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
XXX SUPPORT	7.00	3.75	0.00	0.80	0.80	0.70	0.00	0.00	0.00	0.00
OOO O	7.00	3.75	0.00	0.80	0.80	0.70	0.00	0.00	0.00	0.00
MULTI-CORPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FALSE	2.00	1.00	0.00	0.80	0.80	0.80	0.00	0.00	0.00	0.00

Unit	BC (L M H)	WRA	WMA	WMA	WMA	WMA	WMA	WMA	WMA	WMA
XXX ME	10.00	20.00	25.00	20.00	0.31	0.34	0.31	0.00	1.44	0.40
XXX SE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
XXX SUPPORT	0.00	3.75	7.00	3.75	0.80	0.80	0.70	0.00	0.00	0.00
OOO O	0.00	3.75	7.00	3.75	0.80	0.80	0.70	0.00	0.00	0.00
MULTI-CORPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FALSE	0.00	1.00	2.00	1.00	0.80	0.80	0.80	0.00	0.00	0.00

Unit	TBCs	WRA	WMA	TBC (L M H)	WRA	WMA	WMA	WMA	WMA	WMA
XXX ME	800	265	532	475	541	704	541	127	161	236
XXX SE	0	0	0	0	0	0	0	0	0	0
XXX SUPPORT	150	120	30	0	75	150	75	0	80	120
OOO O	150	120	30	0	75	150	75	0	80	120
MULTI-CORPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FALSE	40	32	8	0	20	40	20	0	10	32

Mean Daily TBC Rate / 1000	Mean Daily WRA	HS High	HS Low	HS W High	HS W Low
XXX ME	0	119	30	40	10
XXX SE	0	0	0	0	0
XXX SUPPORT	3	0	0	0	0
OOO O	3	0	0	0	0
MULTI-CORPS	0.00	0.00	0.00	0.00	0.00
FALSE	1	0	0	0	0

Hot Spots ME XXX	1	2	3	4	5	Total
TBC	119	85	76	81	80	341
WRA	40	32	26	20	20	128

Division TBCs	1	2	3	4	5	Total
Division A (Initial ME)	119	85	76	81	80	510
Division B (2nd ME)	9	85	28	9	9	
Division C (2nd ME)	9	9	76	9	9	
Division D (Reserve)	9	9	9	9	9	

Division WRA	1	2	3	4	5	6	7	8	9	Total
Division A (Initial ME)	40	32	26	20	20					171
Division B (2nd ME)	3	32	10	3	3					
Division C (2nd ME)	3	3	26	3	3					
Division D (Reserve)	3	3	3	3	3					

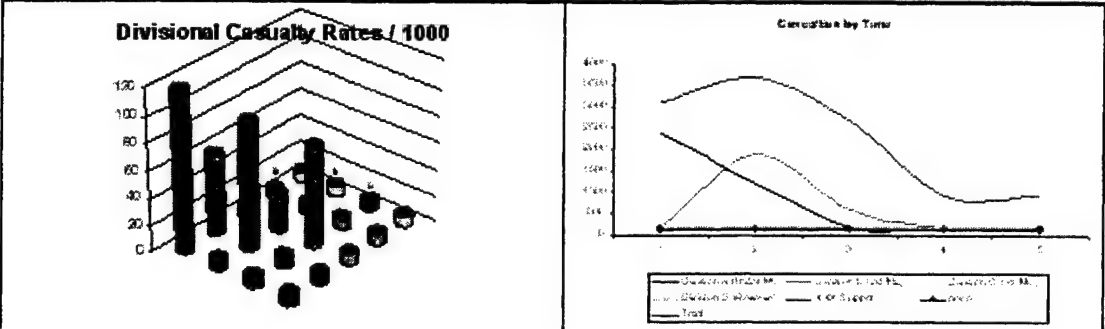


Figure 13. The second manning estimate provided by COSCOM Planner Version .01B is intended for casualty planning experts only. This estimate was derived from the *Chairman of the Joint Chiefs of Staff Guide 3161*, which provides casualty rates based upon three input variables: form of maneuver, time, and posture.

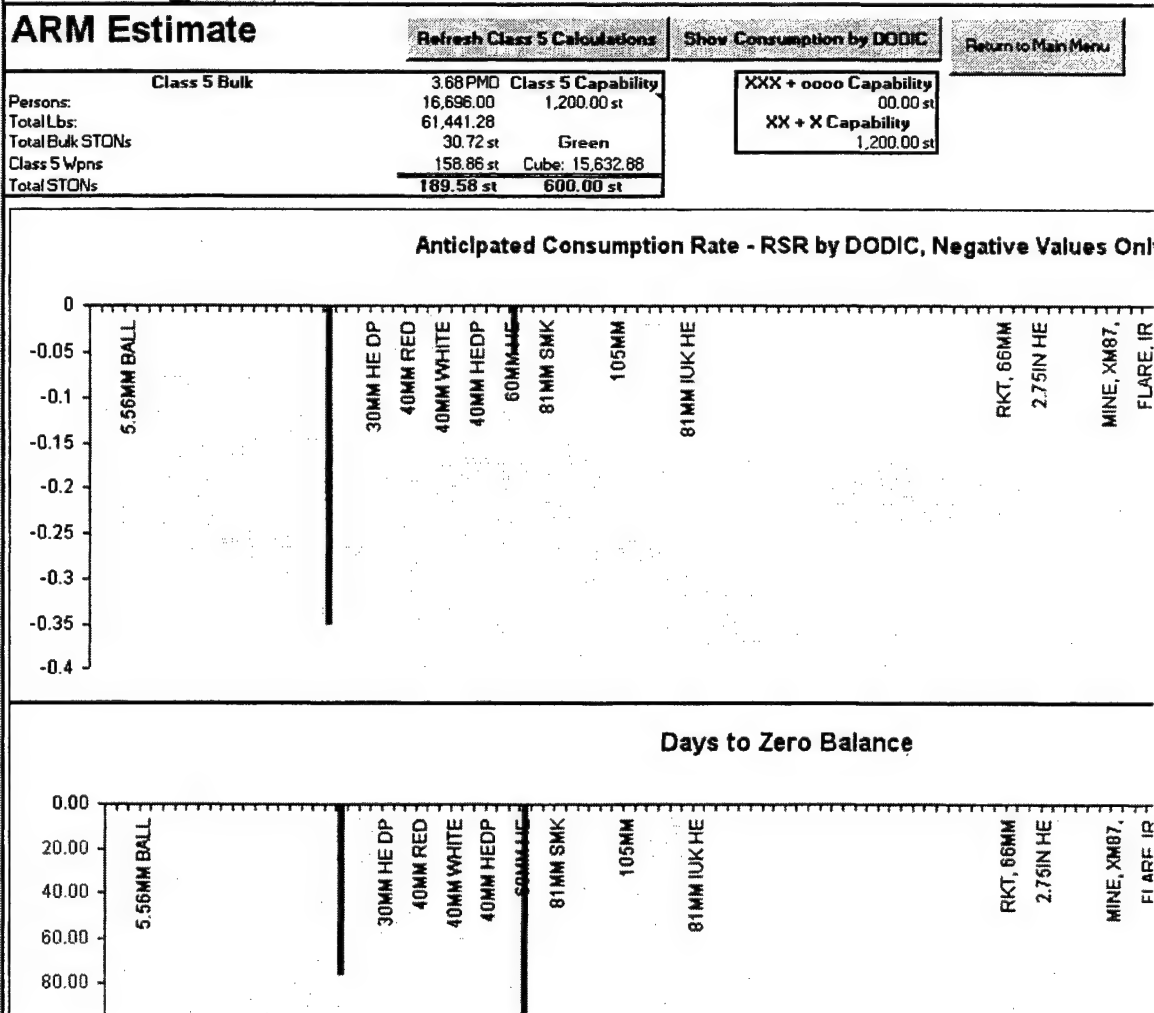


Figure 14. The first of the two arming estimates provides a snapshot about the overall capability of the logistics package to arm the force. Additionally, the anticipated consumption rate by DODIC is graphed along with the days to zero balance lines.



REFRESH CLASS 5 CALCULATIONS										Return to Main Menu	
DODIC	DODIC	QTY	WEIGHT	CUBE	RATE	RSR	DELTA	BASIC LOAD 4 DAYS			
A011	12 GAGE SHOTGUN #00 B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A055	CTG .410 GA NO. 6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A059	5.56MM BALL M855 10/C	502,448.32	15,073.45	312.02	38.39	38.39	38.39	153.56	191.95	230	
A063	5.56MM TRACER M856	165,824.96	6,633.00	105.46	12.67	12.67	12.67	50.68	63.35	70	
A064	5.56MM 4 BALL-1 TR LI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A072	CTG 5.56MM TRCR M196	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A131	7.62MM 4 BALL. 1 TRAC	411,640.64	37,047.66	411.64	1,334.80	400	934.80	5,339.20	6,274.00	7,200	
A136	7.62MM SPECIAL BALL M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A363	CTG 9MM BALL	1,647.75	65.91	0.86	0.65	0.65	0.65	2.60	3.25		
A400	CTG CAL. 38 M41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A475	.45 CAL BALL M1911	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A576	.50 CAL 4 API M8	41,442.64	16,162.63	207.21	128.35	100	28.35	513.40	541.75	570	
A653	20MM 4 HEI M56A3, 1 M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A655	CTG 20MM HEI M56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A792	CTG 20MM HEI-T M246	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A965	25.4MM M839 DECOY	1,675.80	1,173.06	28.49	6.65	7	(0.35)	26.60	26.25	20	
A975	25MM HEI-T M792	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A986	25MM APDS-T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
BT29	30MM HE DP	1,501.20	1,846.48	24.02	20.85	20.85	20.85	83.40	104.25	120	
B504	40MM GREEN STAR PARA	104.80	115.28	3.04	0.08	0.08	0.08	0.32	0.40		
B505	40MM RED STAR PARA M6	104.80	115.28	3.04	0.08	0.08	0.08	0.32	0.40		
B506	40MM RED SMOKE M713	366.80	403.48	10.27	0.28	0.28	0.28	1.12	1.40		
B508	40MM GREEN SMOKE M715	366.80	396.14	9.17	0.28	0.28	0.28	1.12	1.40		
B509	40MM YELLOW SMOKE M71	366.80	403.48	10.27	0.28	0.28	0.28	1.12	1.40		
B535	40MM WHITE STAR PARA	104.80	113.18	2.93	0.08	0.08	0.08	0.32	0.40		
B536	40MM WHITE STAR CLUST	104.80	116.33	2.93	0.08	0.08	0.08	0.32	0.40		
B542	40MM HEDP M430 & M430	2,796.97	3,747.94	95.10	15.24	15.24	15.24	60.96	76.20	90	
B546	40MM HEDP M433	248.90	283.75	7.96	0.19	0.19	0.19	0.76	0.95		
B567	40MM CS M651	248.90	283.75	7.96	0.19	0.19	0.19	0.76	0.95		
B572	CTG 40MM HE M383	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
B642	60MM HE M270	105.30	773.96	16.85	1.95	2	(0.05)	7.80	7.75		
B646	60MM SMK	5.40	39.04	0.74	0.10	0.10	0.10	0.40	0.50		
B647	60MM ILLUM	1.08	7.67	0.18	0.02	0.02	0.02	0.08	0.10		
C276	81MM SMK W/P M375 W/PD	55.08	1,005.21	32.39	1.53	1.53	1.53	6.12	7.65		
C379	120MM HE M934 W/MO FZ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
C380	120MM APFSDS-T M829A1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
C382	PATRON, 84 MM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
C445	105MM HE M1 W/O FUZE	163.08	9,186.30	184.77	3.02	3	0.02	12.08	12.10	10	
C449	105MM ILLUM M314 SERI	1.62	94.49	1.78	0.03	0.03	0.03	0.12	0.15		
C452	105MM HC M84 SERIES	2.70	171.26	3.39	0.05	0.05	0.05	0.20	0.25		
C546	105MM HE M1 W/O FUZE	248.40	17,015.40	295.84	4.60	4.60	4.60	18.40	23.00	20	
C624	120MM SMK W/P XM929 W/	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
C625	120MM ILLUM XM930	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
C787	120MM HEAT-MP-T M830	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
C868	81MM IUK HE M821 W/M7	68.04	1,359.44	41.98	1.89	1.89	1.89	7.56	9.45	10	
C871	81MM ILLUM M853 W/M77	25.56	527.56	17.10	0.71	0.71	0.71	2.84	3.55		
D061	155MM SADARM M898	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
U501	155MM ADAM M692	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Figure 15. The second arming estimate provided is a by DODIC comparison of the projected Required Supply Rate (RSR) versus the anticipated available supply rate in an effort to project the Controlled Supply Rate (CSR). Users enter the RSR in the yellow boxes, which are compared to the automatically computed values in the green boxes. Differences (depicted in red) indicate an RSR higher than the anticipated rate and suggest the need for a CSR.

FUEL Estimate						Return to Main Menu	
	Required		In Tanks	Storage	Delta	Distribution	Delta
Diesel	45,146.79	Diesel	182,830.60	XXX+oooo	-	XXX+oooo	-
JP8	812,133.60	JP8	101,262.00	XX+X	461,900.00	XX+X	250,400.00
Mogas	30,069.13	Mogas	4,292.00				
Total	887,349.52	Total	288,385 g/d	Total	461,900 g/d (425,449.52)	Total	250,400 g/d (636,949.52)
Calculate 30				Reserves	3,549,398 g (3,686,463.01)	Reserve Est.:	-05.1 days
				Storage Status:	Red	Distro Status:	Red

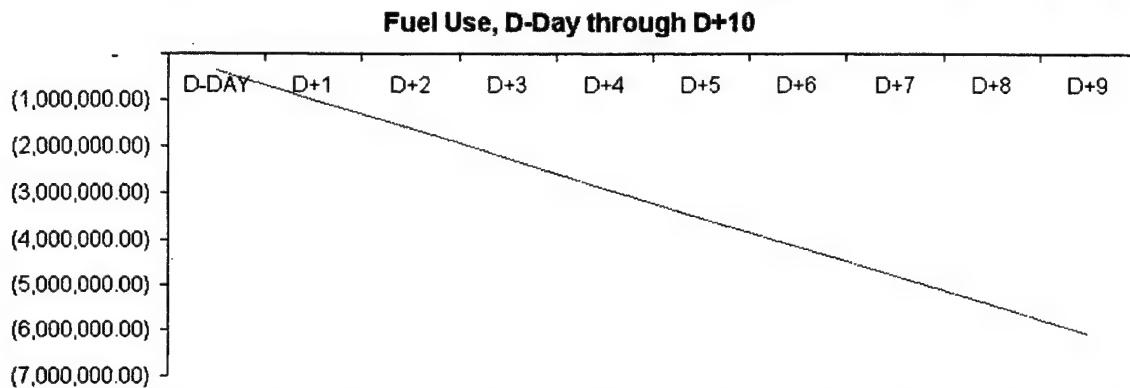


Figure 16. The fueling estimate provides a quick snapshot of the capacity for storing and distributing fuel in the theater. The graph above illustrates the status of fuel over time. Theater and corps assets are analyzed separately from division and brigade assets, and storage and distribution capabilities are assessed separately. The storage and distribution status indicate "red" for insufficient and "green" for sufficient.

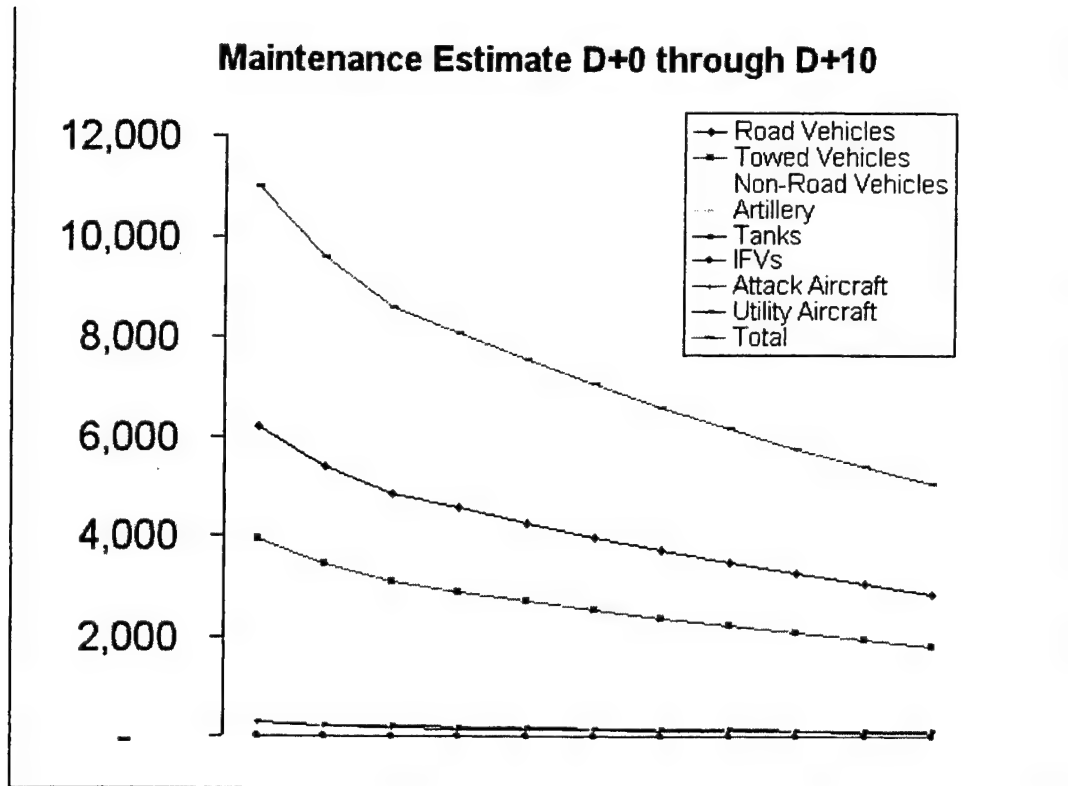


Figure 17. The fixing estimate (based upon generic data and not specific Line Item Numbers) provides a quick snapshot of the projected vehicle losses and recoveries over time. The graph above illustrates visually the status of equipment over time.

# MOVE Estimate

[Return to Main Menu](#)

Battlefield Distro Requirements	624.61 st
Total US STON Capability	1,930.00 st
Total FNS STON Capability	00.00 st
Excess / Short	1,305.39 st

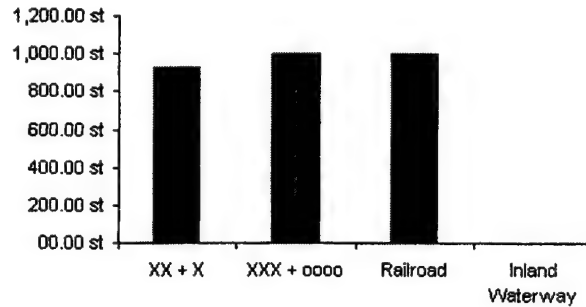
Status for XX + X

Green

Distribution by source	STONs
XX + X	930.00 st
XXX + 0000	1,000.00 st
Railroad	1,000.00 st
Inland Waterway	00.00 st

Distribution by echelon	Delta
XX + X	305.39 st
XXX + 0000	1,375.39 st

Distribution by Source, STONs



Requirements vs. Capabilities by Echelon

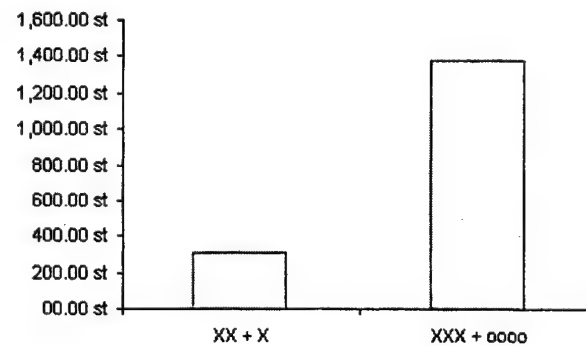


Figure 18. The moving estimate provides battlefield distribution analysis of brigade, divisional, corps and theater assets. The graphs above indicate distribution of goods (less fuel and water) by mode and the requirements for movement versus the capability by echelon. The distinction between divisional and corps assets provides planners a better view of total capability by location.

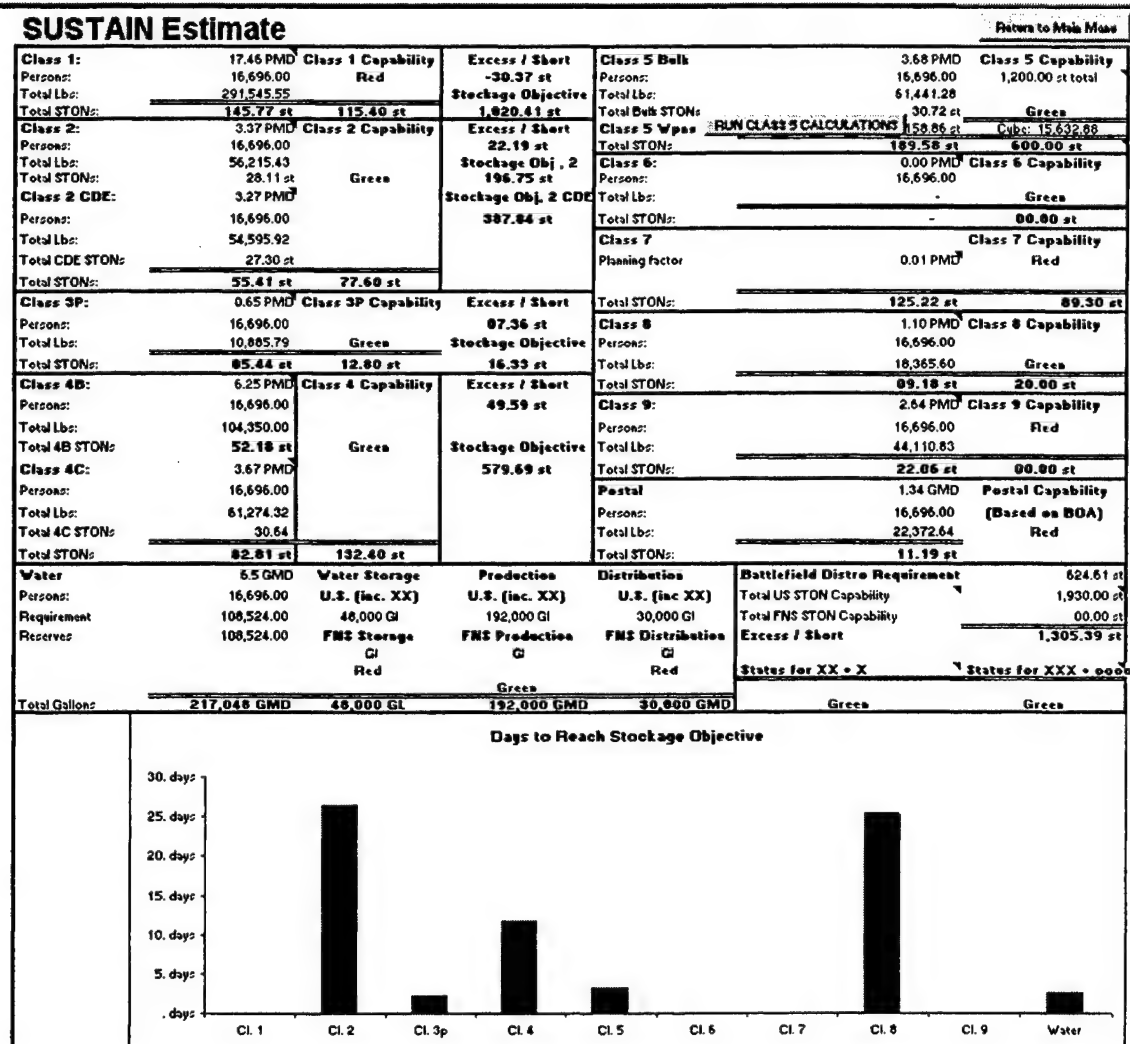


Figure 19. The sustaining estimate provides requirement versus capability analysis and another feature found in no other program discussed in this thesis: days to achieve stockage levels. Prior to the commencement of certain phases, operational planners, supporters, and warfighters desire in theater stockage to reach specified levels. Determining the days to reach this stockage level, although relatively simple, is vital. The graph depicted on the bottom of the estimate provides this analysis.

### Step Five: Model Validation and End User Testing

Model validation is accomplished through results comparison via matrix. By evaluating results from several sources, the accuracy of the model can be ascertained.

Although specifically delimited, end user testing is an important step in determining the worth of COSCOM Planner Version .01B. The end-user must find utility in the program, or it will not survive. Scheduled tests of the program will be conducted later this year; however, the results of these tests will not be available for inclusion in this thesis.

#### Step Six: Utility Matrix

A simple utility matrix provides the final step in the research design. Since end user testing is not feasible due to time constraints, an objective comparison of COSCOM Planner Version .01B to existing software is important. This comparison is relatively easily accomplished using a utility matrix. Criteria selected for evaluation stem from programming observations of the researcher. Since the goal of this utility matrix is to find both strengths and weaknesses of specific products, conclusions about which product is "better" are specifically excluded. Each product has its own merits and flaws. Other users may have a different set of criteria specific to their needs; therefore, this matrix simply provides a look at specific product areas.

## CHAPTER 4

### RESULTS

To discuss the results of this thesis, one must first look at the end product and then ensure that it answers the questions posed in the research question. Second, one must then evaluate the product based upon existing, similar products to determine its efficacy. This chapter accomplishes these two tasks.

#### Revisiting the Research Question

The research question provided key goals for COSCOM Planner Version .01B. Were these accomplished?

The research question required a program capable of comparing logistical requirements to unit capabilities. COSCOM Planner Version .01B accomplishes this feat and provides feedback to provide logisticians a quick snapshot of problem areas.

The research question required the development of a program that could recommend task organizations for logistical support. Using basis of allocation data from MTOEs and other sources, COSCOM Planner Version .01B accomplishes this mission. NOTE: in some cases units without clear basis of allocations were provided logical ones. The recommended combat service support task organization is not the final task organization. The user makes that determination based upon available units, host nation support, and other factors.

The research question required software to be able to evaluate both the operational and tactical logistics functions. COSCOM Planner Version .01B addresses the operational requirements for staging units and all five tactical logistics functions.

Finally the research question required a program that could produce both the personnel and logistics estimate. COSCOM Planner Version .01B an array of estimates including these two as depicted earlier. With these questions answered, the comparison of COSCOM Planner Version .01B with other software is necessary.

#### Results of Model Validation

By comparing the results of COSCOM Planner Version .01B with OPLOG Planner, a clear picture of the accuracy of the software will become evident. Tables 17 and 18 compares the results from OPLOG Planner with COSCOM Planner Version .01B using the air assault division in Korea scenario. The only discrepancy between the two sources involves Class VII, major end items. Because of the bulkiness of the dataset, importing the Class VII LINs vastly affected the speed and performance of the software. Because of this factor, COSCOM Planner Version .01B currently uses a derivative based upon the general trends found in OPLOG Planner and the planning figures from FM 101-10-1, Volumes 1 and 2. Specifically, consumption rates for the Northeast Asia theater are higher than the "Other (Average)" theater and are vastly higher than the Southwest Asia rates. By using adjustment factors to evaluate the change based on region, the Class VII estimate is similar to that of OPLOG Planner.



Table 17. A Comparison of COSCOM Planner to Other Resources

	OPLOG Planner	<i>ST 101-6</i>	<i>FM 55-15</i>	<i>FM 101-10-1 Rates</i>	COSCOM Planner
RSOI Estimate	No	No	Provides data	No	Yes
Manning Estimate	No	Provides Data	No	Yes (based on World War II rates)	Yes (based on <i>ST 101-6</i> and <i>CJCS 3161</i> )
Arming Estimate	Yes	Provides wrong data	Planning figure	Yes	Yes
Fixing Estimate (excluding Class IX)	No, but a related Class VII estimate	Provides planning data for some major units	No	No	Yes (based on <i>ST 101-6</i> )
Fueling Estimate	Yes	Provides a table	Provides a table for divisions		Yes

Note: A quick comparison of COSCOM Planner to other resources using the air assault division in Korea illustrates the utility of the program. Each program has its strengths and weaknesses; however, COSCOM Planner addresses more of the estimate issues. The next table will further illustrate its utility and its accuracy compared to other resources.

Table 18. A Comparison of COSCOM Planner to Other Resources

	OPLOG Planner	<i>ST 101-6</i>	<i>FM 55-15</i>	<i>FM 101-10-1 Rates</i>	COSCOM Planner
Class I (Rate)	5.689 PMD		5.689 PMD	4.03 PMD	5.689 PMD
Class II (Rate)	3.367 PMD	3.367 PMD	3.17 PMD	3.67	3.367 PMD
Class IIIP (Rate)	.51 PMD	.51 PMD	.51 PMD	.59	.51 PMD
Class IIIB (Total)	353,840 GMD	353,840 GMD (table)	270,196 GMD	53.7	353,840 GMD
Class IV (Rate)	9.92 PMD	9.92 PMD	8.5 PMD	8.5	9.92 PMD

Class V (Total)	158.86 STONs (less bulk)	349.3 STONs (less bulk)	847 STONs	1572.2 STONs day 1, 1297.8 day 2 and on	158.86 STONs (less bulk)
Class VI (Rate) (after 60 days)	2.06 PMD	2.06 PMD	2.06 PMD	3.2 PMD	2.06 PMD
Class VII (Total)	105.84 STONs	N/A	198 STONs	125.22 STONs	125.22 STONs
Class VIII (Rate)	1.1 PMD	1.1 PMD	.65 PMD (Intense combat)	1.22	1.1 PMD
Class IX (Rate)	No Calculation	2.5 PMD	2.5 PMD	2.50 PMD	2.5 PMD
Water (Rate)	6.5 GMD	6.5 GMD	7.0 GMD	7.0 GMD (Min)	6.5 GMD
CDE Modifier	N/A	3.27 PMD	N/A	3.27 PMD	3.27 PMD
Postal (Rate)	1.34 PMD	N/A	N/A	N/A	1.34 PMD
Stockage Objectives	No	Data only	No	No	Yes

Note: A quick comparison of COSCOM Planner to other resources using the air assault division in Korea illustrates the utility of the program.

#### Results of Programming

After evaluating qualitatively the results from COSCOM Planner Version .01B, the results of the programming effort can be evaluated based upon the predetermined criteria. Results of the utility matrix analysis of COSCOM Planner Version .01B indicate that the tool addresses more of the evaluation criteria than either OPLOG Planner and the LEW. NOTE: every individual user has his or her own set of evaluation criteria. No

conclusions about the utility of the software should be suggested until operational testing is complete. Table 19 provides a snapshot of the utility matrix.

Table 19. Utility Matrix

	<i>Speed</i>	<i>Size</i>	<i>Unit Capability</i>	<i>Shortfalls</i>	<i>Stockage</i>	<i>Personnel Estimate</i>	<i>Terminal Throughput</i>	<i>User Friendliness</i>	<i>Total</i>
<b>Lew</b>	1	1	2.5	2.5	2.5	1.5	2.5	1.5	15
<b>OPLOG Planner</b>	2	2	2.5	2.5	2.5	3	2.5	1.5	18.5
<b>COSCOM Planner</b>	3	3	1	1	1	1.5	1	3	14.5

Note: The utility matrix (without weights) appears below. The lower values indicate a better assessment.

In evaluating the products qualitatively, the logistician is provided with a more complete analysis of the logistics problem by using COSCOM Planner Version .01B vice OPLOG Planner or the LEW. This additional capability provides a more thorough analysis for the logistician and more readily identifies the shortage areas.

The speed of COSCOM Planner Version .01B ranks below that of OPLOG Planner and the LEW. The very size of the program makes it slightly unwieldy. In fact, the program ranks dead last in terms of size as well.

In terms of analyzing unit capability, COSCOM Planner Version .01B is the only program that does this function along with providing recommended units for specific

missions. Along with providing the estimates, COSCOM Planner Version .01B also provides an assessment of the operational logistics functions and stockage objectives. Inadequacies.

COSCOM Planner Version .01B must undergo many transitions before it is ready for full-fielding. First, the re-order lists provided by OPLOG Planner must be added. Second, the speed of the program must improve through better code. Third COSCOM Planner Version .01B requires testing by usability groups to ensure that the product will actually be useful to the majority of persons. Fourth, specific phasing operations must be added to improve functionality. With these four improvements, COSCOM Planner will provide logisticians with a powerful method for mission analysis.

## CHAPTER 5

### RECOMMENDATIONS AND CONCLUSIONS

Logisticians need one single planning tool, which will provide them the information they need to complete mission analysis. COSCOM Planner Version .01B provides the nucleus for this tool. Although it can not initially replace OPLOG Planner, the two programs should merge to provide the logistician a better array of "weaponry" for battle. Generally speaking, it is more useful to the operational logistician than OPLOG Planner or other logistics databases. In evaluating recommendations for this research two areas must be addressed: recommendations for beta testing and recommendations for software development. Both will be evaluated in turn

#### Recommendations for Beta Testing

COSCOM Planner Version .01B requires extensive field testing and comparison before it is ready for prime-time fielding; nevertheless, this fielding is clearly the desired end state. Students from the Command and General Staff College should be provided the software as an alternative to OPLOG Planner and be allowed to provide the appropriate feedback to modify the program.

#### Recommendations for Software Development

COSCOM Planner Version .01B can be significantly improved. At the operational level, inclusion of Military Traffic Management Command seaport data would make the program infinitely more valuable for the operational logistician. Better methodology for handling staging estimations could be developed based upon more complete databases. Actual simulation flow from port to port and application of queuing

theory in its entirety would improve the analysis of intertheater movement, while simulation would improve the analysis of intratheater movement as well. Although the current version of the program is deterministic, future versions can convert the information into distributions and move towards a more stochastic model.

At the tactical level of logistics, more accurate determinations of Class V usage would significantly improve the program. A final determination regarding STON usage is necessary in order to plan realistically for Class V consumption. OPLOG Planner provides a great methodology for this planning, but the STON numbers appear to be too low for inclusion at this time.

The final software development recommendation involves contracting for program development and upkeep. Good software is continuously updated. The usefulness of this logistician's tool is significant enough that it warrants consideration for outsourcing.

### Conclusions

Continuous progress in logistics software development is important to the success of the military logistics community as the increase in complexity requires an increased reliance on our electronic force multipliers. Through detailed planning, a logistician provides realistic assessments of supportability to the warfighters. Without logistics automation tools, the analysis of the tactical and operational problem by the logistician is significantly impeded. COSCOM Planner Version .01B fulfills the goals of the research question; however, its usefulness in the field remains to be seen. Any tool that successfully reduces the workload and analysis of a logistician is valuable; however, the

true value must be assessed by the end users. This assessment is the focus of future research.

## GLOSSARY

Class 1	Subsistence
Class 2	Clothing, components of sets, kits, and outfits
Class 3P	Packaged Petroleum, Oil, and Lubricants (POL)
Class 3B	Bulk POL (fuel)
Class 4B	Engineer materiel, barrier
Class 4C	Engineer materiel, construction
Class 5	Ammunition
Class 6	Personal demand items (soldier purchased)
Class 7	Major End Items (tanks, trucks, helicopters)
Class 8	Medical items
Class 9	Repair parts
Class 10	Civil-military items



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